

CTI 2572
ETHERNET TCP/IP MODULE
INSTALLATION AND OPERATION GUIDE
Version 2.4

CTI Part # 062-00146-024



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V2.4	10/9/01	Incorporated addendum material Revised Uncoupled Mode description to indicate that Command Block would not be re-read if the Command Trigger were held high. Corrected typographical errors
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PREFACE

This ***Installation and Operation Guide*** provides installation and operation instructions for the CTI 2572 Ethernet TCP/IP Adapter Module. The information in this manual is directed to individuals who will be installing, maintaining, and troubleshooting the module.

We assume you are familiar with the installation and operation of:

- 1) SIMATIC 505 programmable controllers,
- 2) Ethernet local area networks,
- 3) Transmission Control Protocol/Internet Protocol.

Please refer to the appropriate SIMATIC user documentation for specific information on SIMATIC 505 programmable controllers and I/O modules.

If you plan on developing or writing computer applications which interface to the module via TCP/IP you should also obtain the *CTI 2572 Programming Reference Manual* (CTI Part # 62-166), which provides detailed information on the module command message interface.

USAGE CONVENTIONS

NOTE:

Notes alert the user to special features or procedures.

CAUTION:

Cautions alert the user to procedures that could damage equipment.

WARNING:

Warnings alert the user to procedures that could damage equipment and endanger the user.

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CHAPTER 1. DESCRIPTION

1.1. Introduction

The CTI 2572 Ethernet TCP/IP Adapter is a single wide I/O module for SIMATIC 505 controllers. The 2572 module connects to Ethernet local area networks, enabling the PLC to communicate with other network stations using the Transmission Control Protocol/Internet Protocol (TCP/IP). Using the CTI 2572 facilities, suitably programmed network stations can acquire data from the PLC, send data and programs to the PLC, and exercise supervisory control over the PLC operation. In addition, the PLC can use the CTI 2572 to access data in other PLC systems equipped with a CTI 2572.

The 2572 attaches to all Ethernet media specified by IEEE 802.3 including 10Base5 ("thick" coaxial cable), 10Base2 ("thin" coaxial cable), 10BaseT (unshielded twisted pair cabling), FOIRL (fiber optic cable) and 10BaseFL (fiber optic cable). 10BaseT cabling can be attached directly to the 2572 via an RJ-45 connector. Other IEEE 802.3 media may be connected to the AUI (Attachment Unit Interface) port via a user supplied transceiver.

The 2572 module also provides two serial ports that can be used for configuration and diagnostic activities. Both serial ports can operate concurrently.

The 2572 module itself requires no customer programming. All configuration options can be set by module switches or written to module EEPROM via a serially attached personal computer. Optionally, PLC logic can be used to set module configuration and to control the operation of the module.

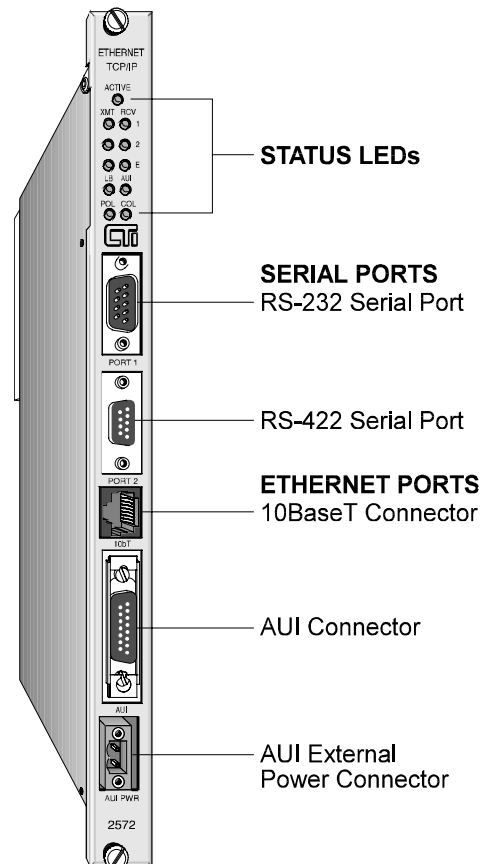


Figure 1. 2572 Front Panel

1.2. Ethernet Ports

The 2572 provides an IEEE 802.3 10BaseT port and an IEEE 802.3 AUI port. The 10BaseT port connects to Unshielded Twisted Pair (UTP) cable using an RJ-45 connector. The 15-pin AUI connector is used to attach a transceiver to the 2572. The transceiver, in turn, connects to the desired Ethernet medium. Different transceivers are available for the various 802.3 media. Thus, using a transceiver, the 2572 can connect to coaxial, UTP, or fiber optic cable.

Only one of the Ethernet ports is active at a time. The 2572 module automatically selects the port to

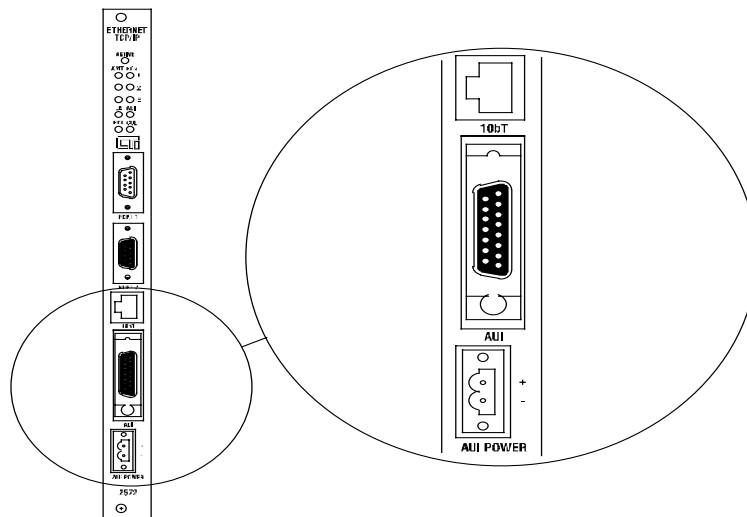


Figure 2. 2572 Ethernet Ports

be used based on the signal received. If a signal known as a *link beat* is detected on the 10BaseT port, then the 10BaseT port will be selected. If a link beat is not detected on the 10BaseT port, then the AUI port will be selected.

The auto-selection feature allows you to run redundant cabling, if you wish. If the link beat is lost on the primary 10BaseT port (typically indicating a cable problem), the 2572 will automatically switch over to the AUI port. When the link beat returns on the 10BaseT port, the module will switch back to the 10baseT port. A bit in the Module Status Word can be used by PLC logic to monitor which port is active. If bit 6 is on, then the AUI port is selected; if the bit is off, then the 10BaseT port is selected. See Appendix C for more information.

Ethernet transceivers are typically powered from the AUI port. The 2572 will supply the AUI port with power derived from the PLC backplane. In certain configurations, however, you may wish to conserve backplane power. For these circumstances, the 2572 module provides a connector that allows you to attach an external 12 VDC power supply. The external power supply can then supply power to the AUI port. Refer to Chapter 2 of this manual for installation details.

1.3. Serial Ports

The 2572 is equipped with two serial ports. These ports are provided for use with module configuration and diagnostic programs. In addition, the ports may be used to access the local PLC. Devices that communicate with the PLC using the Non Intelligent Terminal Protocol (NITP) can access the PLC processor as if they were directly connected to the PLC program port.

Optionally, NITP commands sent to a serial port can be *redirected* to another node on the TCP/IP network. Using this feature, PLC programming software program running on a PC connected to a 2572 serial port can perform remote programming on another PLC on the network. This feature might be used where a programming tool that uses TCP/IP (such as SoftShop programming software) is not available.

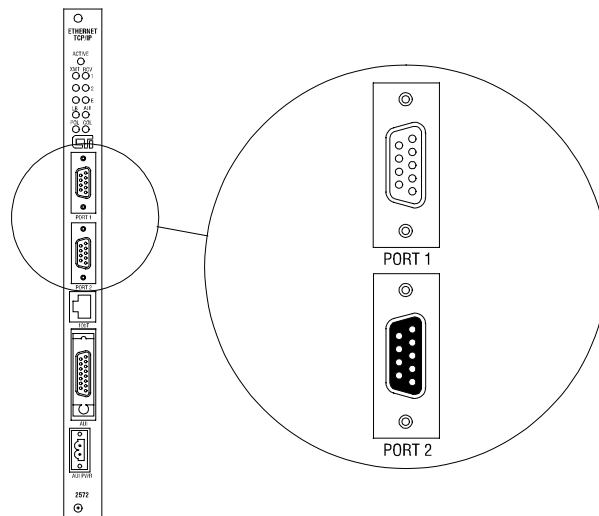


Figure 3. 2572 Serial Ports

Port 1 uses a male DB9 connector to provide a subset of RS-232C. Port 2 provides an RS-422 electrical interface using a female DB9 connector. Since the pin configurations of the ports match those of SIMATIC TI545 PLCs and the 2571 Programming Port Expander module, standard cables can be used. The ports may be configured via switches for baud rates of 1200, 2400, 9600, or 19,200. Optionally, PLC logic can be used to set the communications parameters for the ports. Both ports can operate concurrently with the Ethernet port; however, heavy serial port activity may degrade network performance. See *Appendix A* for a diagram showing the port pin configurations.

1.4. LED Indicators

The 2572 provides an array of LEDs that inform the user of the module status and communications activity. The functions of the LEDs are described below:

ACTIVE *Active Status.* Indicates the status of the module hardware. Solid illumination indicates the module status is good. Slow blinking indicates the module has detected a fault condition. Rapid blinking indicates that the network parameters have not been set or are invalid.

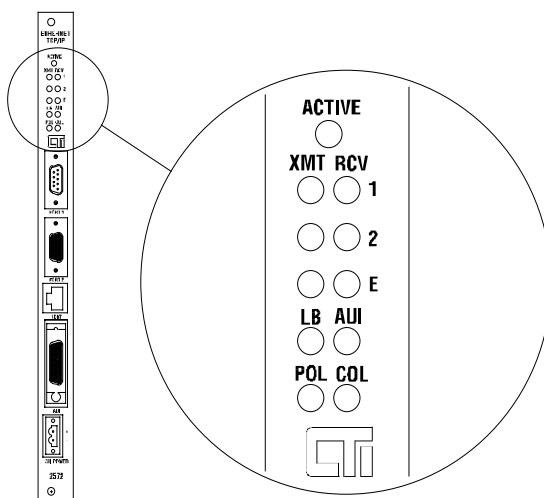


Figure 4. LED Indicators

XMT *Transmit.* There is one LED each for Serial Port 1, Serial Port 2, and Ethernet, which lights when data is transmitted on the applicable port.

RCV *Receive.* There is one LED each for Serial Port 1, Serial Port 2, and Ethernet. These LEDs will light when a signal is received on the applicable port. The Ethernet LED will flash when *any* network traffic is detected, not just valid packets or packets addressed to the module.

LB *Link Beat.* Indicates that a link beat signal is being received on the 10BaseT port and that the 10BaseT port is selected. This LED should be lit if 10BaseT is being used.

AUI *Attachment Unit Interface.* Lights to indicate that the AUI port is selected for Ethernet communications. If a link beat is *not* detected on the 10BaseT port, the AUI port will be automatically selected.

NOTE:

The fact that the AUI LED is lit does not indicate that the attached transceiver is operating properly.

POL *Polarity Reversed.* Lights when the polarity for the UTP cable connected to the 10BaseT port has been reversed. This is a warning only, since the 2572 hardware will correct for reversed polarity.

COL *Collision.* Lights when a collision is detected. Some collisions are normal when using Ethernet. Excessive collision activity may indicate faulty cable termination, defective transceivers, or an overloaded network.

1.5. Functional Overview

The 2572 can operate as both a PLC *server* and a PLC *client*. As a PLC server, the 2572 *responds* to messages sent by another network node. As a PLC client, the 2572 *initiates* messages on command from the PLC.

PLC Server Function

The 2572 can function as a server to clients who wish to access the PLC. Figure 5 illustrates the typical message dialog between the client, the 2572, and the PLC.

- 1) The client node sends a command message to the 2572 via TCP/IP. For example, the client may request that the 2572 read and return 25 words of V memory.

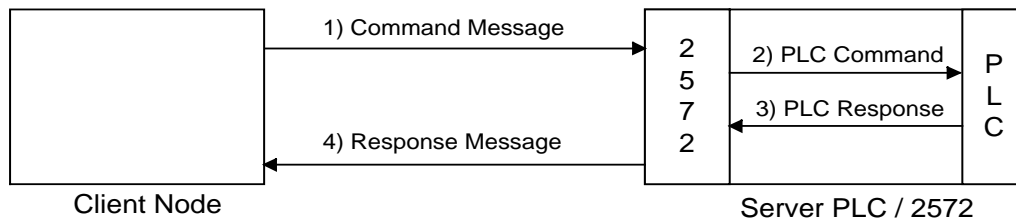


Figure 5. PLC Server Function

- 2) Based on the contents of a command message, the 2572 sends commands and data to the PLC processor via the backplane. For example, the 2572 would issue the applicable command to the PLC to retrieve 25 words of V memory.
- 3) The PLC processor responds to the command via the backplane. In the example, the PLC would return 25 V memory words.
- 4) After the PLC responds, the 2572 builds the appropriate message and returns it to the client node. In this example, the 2572 would build a network message containing the 25 words of data and send it to the client that requested it.

Messages between the 2572 and the client node are encapsulated in the TCP/IP protocol. The client device must create the TCP/IP packet containing the command and must process responses from the 2572 returned via TCP/IP. The client node may be a suitably programmed computer or another 2572 on the network (see next section). Please reference the CTI 2572 Programming Reference Manual for details regarding the message interface.

The 2572 will support multiple concurrent client/server sessions. To operate the CTI 2572 as a PLC server, no PLC logic changes are *required*. However, you may wish to add PLC logic to set the network parameters for the module (see page 19, section 2.6. *Using PLC Logic to Start the Network Server*).

PLC Client Function

The 2572 can also function as a *PLC Client*. As a PLC Client, the 2572 acts as an agent for the PLC; it sends messages to other nodes and processes the responses under control of the PLC logic. Data in the PLC program specifies the recipient and data contents of the message. PLC logic sets a “trigger” bit to cause the 2572 to send the message.

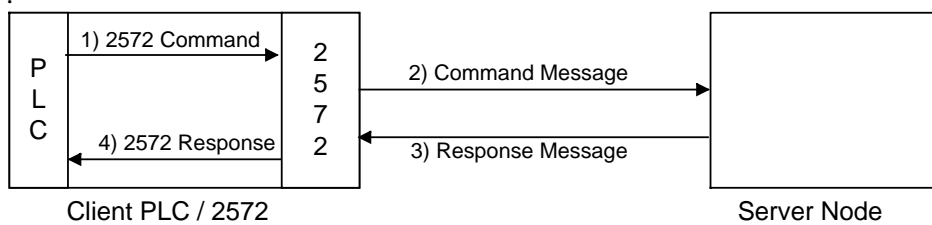


Figure 6. PLC Client Function

In the example above:

- 1) When the PLC detects a specified event, it sends a command to the local 2572. For example, the command could be to read 5 words from another node on the network.
- 2) Based on the command, the 2572 then sends the applicable command via TCP/IP to the specified network (server) node.
- 3) The server node processes the command and returns a response via TCP/IP. In the example, the server node would return a message containing the specified words.
- 4) The 2572 processes the network message and notifies the PLC that the operation is complete. In the example, the 2572 would place the words in a specified PLC memory location and signal completion of the task.

The 2572 can support multiple concurrent client sessions. The server node shown in the illustration could be another 2572 or a computer programmed to process the commands and send the appropriate responses. Information describing the PLC logic required for client operation can be found in Chapter 3 of this manual.

The 2572 can support multiple server sessions and multiple client sessions concurrently. Therefore, networked PLCs can use the facilities of the 2572 to participate in multi-session peer-to-peer communications.

1.6. TCP/IP Overview

The CTI 2572 module uses TCP/IP (Transmission Control Protocol/Internet Protocol) to transport messages between the module and other nodes on the network. TCP/IP is a suite of protocols that provide routing and delivery services for messages between application programs running on different processors (called hosts in TCP/IP terminology). You may select between connectionless (packet based) or connection-oriented (stream based) delivery services.

Connectionless Delivery

Connectionless delivery services allow you to send a message to another node without previously establishing a logical connection to the other node. TCP/IP provides a format known as the USER DATAGRAM PROTOCOL (UDP) for sending and receiving connectionless messages. Connectionless delivery is simple to implement and consumes a small amount of system resources. However, delivery of UDP messages is not confirmed by the *network* protocol. It is left to higher level protocols to acknowledge receipt of a message. Since the Common ASCII Message Protocol (CAMP) used with the 2572 will acknowledge receipt of a command message, UDP is the preferred protocol for most applications, such as process monitoring, which obtain data from the PLC.

Connection-Oriented Delivery

With connection-oriented services, you must first establish a logical connection (known as a *virtual circuit*) before network nodes can exchange messages. TCP/IP uses the TRANSMISSION CONTROL PROTOCOL (TCP) to implement connection-oriented services. TCP provides guaranteed delivery and message flow control. If a message is not delivered correctly, the TCP protocol will automatically retry. Since TCP is stream oriented, meaning the application program sees a properly sequenced stream of data rather than individual packets, it is often used for file transfer applications such as program downloads. You may choose to use TCP for applications, such as data logging, which require a specific piece of data be delivered in order.

Socket Interface

TCP/IP uses a standard structure known as a *socket*, for the application program interface. The de facto socket standard is the *Berkeley Socket*, named for the University of California at Berkeley, who originally distributed TCP/IP. Originally, the Berkeley Sockets were used with only the Unix operating system. Today, Microsoft Windows includes TCP/IP support using the *Winsock* standard, a derivative of the Berkeley Socket standard.

Summary

The TCP/IP protocol is used to send and receive messages via the network. It will function over the local Ethernet network or over Wide Area Networks. TCP/IP supports both connectionless (UDP) and connection oriented (TCP) services. UDP is usually sufficient for most applications because the higher-level application protocol (CAMP) incorporates an acknowledgment to commands. TCP/IP network software for an IBM compatible personal computer is readily available from a wide range of sources. For a complete discussion of the TCP/IP protocol, see *Internetworking with TCP/IP* by Douglas Comer (1991, Prentice Hall) or other commonly available reference material.

1.7. PLC Command Interface

Some 2572 functions require that you use PLC logic to control the operation of the module. The 2572 module provides a standard PLC logic interface for sending messages and processing responses. The interface consists of two parts:

- **Command Blocks** - Command Blocks are blocks of contiguous V memory words used to store module commands and associated parameters. The exact content of the Command Block will vary with the command being issued.
- **Module WX/WY Words** - The 2572 module logs in as a Special Function module and is assigned two WX words and six WY words. PLC logic uses the WY words to select the Command Block and to trigger the command execution. The status of the module and of command execution can be monitored via the WX words.

Figure 7 illustrates how the module WX/WY words and the command blocks are used together. The 2572 writes values in the WX words, the PLC writes values in the WY words. WX1 and WY3 contains bits allow the PLC to monitor and control module global status. WY4 and WX2 contain bits that allow the PLC to trigger commands and monitor command status. The Command Slots (WY5-8) are used to point to the starting V Memory addresses of the Command Blocks.

To use the module command interface, your PLC logic typically loads a Command Slot with the address of the desired command block. It then sets a corresponding trigger bit in WY4 to cause the 2572 to execute the command. Your logic then monitors the condition of the command status bits in WX2 to determine whether the command completed successfully.

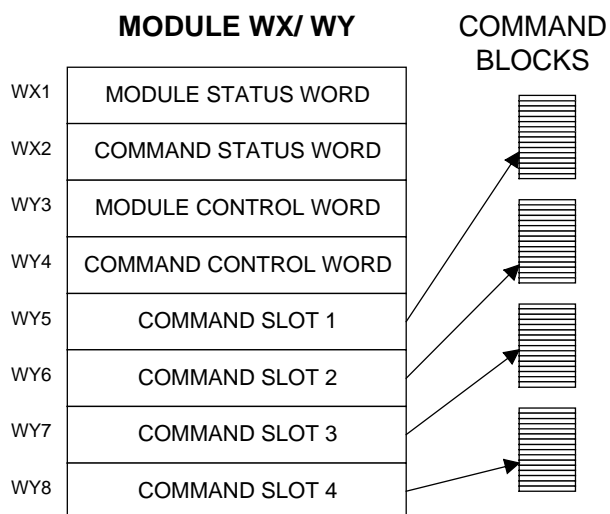


Figure 7. 2572 PLC Interface

Please refer to Appendix D for a complete description of the PLC Command Interface.

1.8. Getting Started

Assigning an IP Address

Before proceeding you must determine what IP address you will assign to the module. If you are connecting to an existing network, your network administrator will provide this information. If you plan on connecting your network to the Internet you should contact the Internet *Network Information Center* (NIC) for IP address assignment. If you are installing a stand-alone network, you may choose any set of IP addresses as long as they adhere to IP addressing conventions. See Appendix E of this manual for a description of the IP Address numbering conventions.

Choosing and implementing a Module Startup Method

Before the 2572 will accept TCP/IP messages, the module Network Server must be started. You can use PLC logic to assign the IP address and to start the Network Server or you can have the module automatically start the Network Server using an IP address stored in the 2572 EEPROM. See *Chapter 2* for a description of these methods. If you choose to use PLC logic, you will need to create a command block and incorporate a few rungs of ladder into your program. See *Section 2.6. Using PLC Logic to Start the Network Server* on page 19.

Setting Module Switches

Module dipswitches configure the serial ports and select the startup method. See *Section 2.4. Setting the 2572 Switches* on page 14 for a complete description.

Installing the Module in the PLC I/O Base

The 2572 is a single wide module that installs in a standard SIMATIC 505 PLC rack. For best performance you should install the 2572 in the first I/O slot of the local base. Chapter 2 describes unpacking and installation of the module.

Logging the Module in the PLC I/O Configuration

When you initially install the module in the PLC I/O base, you must log the module into the PLC I/O configuration. The 2572 logs in as 2 WX and 6 WY words. See *Checking PLC Login* in *Chapter 2* on page 18.

NOTE:

The module will not operate properly until it has been logged in.

Connecting the Module to the Network

You can choose to connect the module directly to 10BaseT cabling or, via a transceiver, to any IEEE 802.3 compliant media. See *Section 2.8. Connecting Cables* on page 26.

Checking out the Module

You can use both the module indicators and commonly available software to ensure the module is operating properly. *Section 2.9. Module Checkout* on page 27, describes these procedure. *Chapter 4* also describes the module operation.

Using the Module

Assuming you have completed the above steps successfully, the 2572 module is ready for use as a PLC Server. If you wish to implement PLC Client functions, please refer to *Chapter 3* of this manual.

CHAPTER 2. INSTALLATION

The installation of the Model 2572 Ethernet TCP/IP Adapter Module consists of the following steps:

- 1) Planning the installation,
- 2) Unpacking and configuring the module,
- 3) Physical installation,
- 4) Setting IP information,
- 5) Connecting cables,
- 6) Checking the module operation.

2.1. Installation Planning

Ethernet Media

The Model 2572 attaches directly to 10BaseT media (Unshielded Twisted Pair) via the RJ-45 connector. You should select cabling rated CAT 5 or better. Should you choose another Ethernet medium, you must obtain the appropriate transceiver to attach to the AUI port. Ensure that the cables you use for Ethernet communications meet the IEEE 802.3 specifications and are appropriate for the environment in which you are operating.

NOTE:

Check your cabling carefully. Faulty cables and/or connectors are the leading cause of Ethernet communications problems.

Serial Communications

The serial ports on the 2572 module are provided for configuration and diagnostic purposes. For typical applications, you can use a standard serial PLC programming cable. Although you may use the ports to access the PLC, applications or devices that place a heavy transaction load on the module will degrade network performance. If you have a need to service these devices, consider installing a separate CTI 2573 module.

Establishing Network Parameters

Before the 2572 can communicate on a TCP/IP network, you must establish the network parameters. These include an *IP Address* and *Subnet Mask* for the module, a *TCP/UDP port number* for the PLC Network Server function, and, if your network contains a router, the IP address of the *Default Router*. See Appendix E for a complete description of TCP/IP address nomenclature. You may also wish to refer to general publications describing TCP/IP.

You have a choice of two methods for establishing the network parameters. One method allows you to use the PLC program to set the IP address and other network parameters. The second method

allows you to load the information directly from data stored in EEPROM on the 2572. You will need to decide which method best suits your requirements.

NOTE:

Unless your application requirements dictate otherwise, CTI recommends that you allow the PLC to establish the network parameters.

If you choose to establish the network parameters using PLC logic, the 2572 will wait for the PLC to initiate network startup. Using a special 2572 startup command, the PLC can set the network parameters. When the module is reset for any reason (for example, during module replacement), the PLC must restart the server software and re-load the network parameters. The PLC logic to perform this function is described in Section 2.6 on page 19. Since the IP information is reloaded from the PLC and is not stored in the module, the IP address remains with the PLC, even if the 2572 modules are swapped.

If you choose to obtain the network parameters from the EEPROM, the module automatically initiates network startup based on the values in EEPROM. No PLC logic is required to set the network parameters. Since the IP address is not associated with the PLC program, you can download a common program to multiple PLCs using the TCP/IP network. However, if you arbitrarily swap 2572 modules between PLCs, the IP address will move with the module. The effect of inadvertently swapping IP addresses can cause major problems, since communications directed at one PLC would actually be going to another PLC.

WARNING:

If you choose to obtain the network parameters from EEPROM, you should ensure your maintenance procedures safeguard against inadvertent module swaps.

NOTE:

You will need to specify the IP address of the module, the logical port number for the PLC server function, subnet mask, and the IP address of the default router. You may need to obtain some of this information from your network administrator before you begin.

2.2. Power Requirements

The Model 2572 requires 6 watts of +5 VDC power, not including any power supplied to a transceiver connected to the AUI port. If your media configuration requires a transceiver and you wish to power it from the AUI port, you should include the transceiver power requirement in your power calculations. The formula for slot power calculation is:

$$P = 6 + (TP \times 1.15)$$

where P = total power slot requirement in watts and

TP = transceiver power requirement in watts.

IEEE 802.3 specifications allow a transceiver to draw a maximum of 500 ma at 12 VDC from the AUI port. In practice, many transceivers draw considerably less. Should the total power required

exceed the backplane limitation, you may power the AUI from an external 12 VDC power supply. The 2572 module provides a front panel connector for attaching an external AUI power supply.

NOTE:

The AUI external power circuit contains a reverse protection diode that may induce up to a 0.5 volt drop. Most transceivers can tolerate this voltage drop. If your transceiver cannot, you should adjust your external power supply to compensate.

CAUTION:

If you are using a transceiver, make sure that you have included the power requirements for the transceiver in your calculations. Before inserting the module into the I/O base, ensure that the PLC power supply capacity is not exceeded.

2.3. Unpacking the Module

Open the shipping carton and remove the special anti-static bag that contains the module. After discharging any static build-up, remove the module from the static bag. Do not discard the static bag. Always use this bag for protection against static damage when the module is not inserted into the I/O base.

CAUTION:

The components on the 2572 module printed circuit card can be damaged by static electricity discharge. To prevent this damage, the module is shipped in a special anti-static bag. Static control precautions should be followed when removing the module from the bag and when handling the printed circuit card during configuration.

2.4. Setting the 2572 Switches

Switches on the 2572 are used to select the following:

- AUI Power
- Serial Port Baud Rate
- Hardware Handshaking (RS-232 port)
- DataShare Enable
- Network Startup Option
- EEPROM Write Protect
- Serial Port Protocol

Figure 8 indicates the location of the switches.

AUI Power Source Switch

The AUI port allows external transceivers to be attached to the module. The AUI power source switch is used to select whether transceiver power is obtained from the PLC backplane or an external power source. In most cases, you can set the switch to the INTERNAL position. If you are using a transceiver that exceeds your backplane power budget, use the External setting and provide an external power supply. If you are not using the AUI port, the position of this switch does not matter.

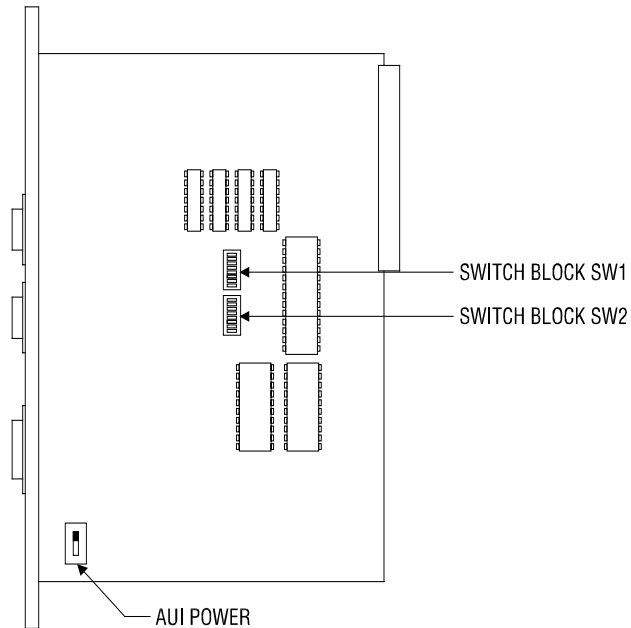


Figure 8. 2572 Switch Locations

Switchblock 1

Switchblock 1 is used to set the communications parameters for serial port 1.

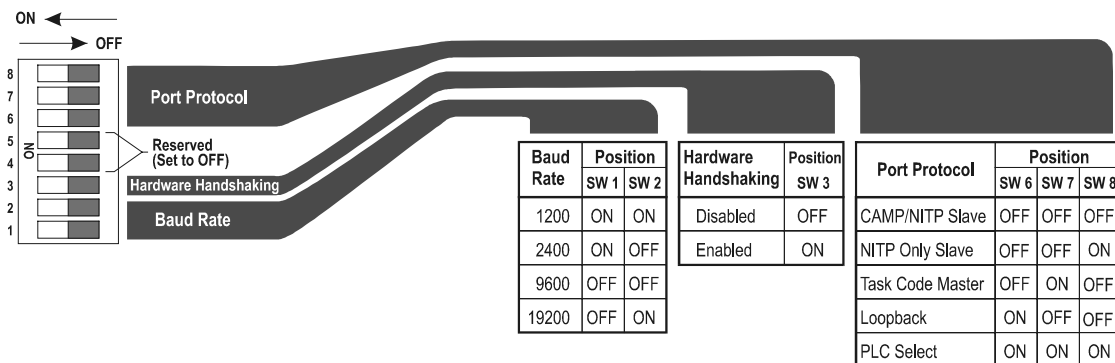


Figure 9. Switchblock 1

Switchblock 2

Switchblock 2 is used to set the communications parameters for serial port 2. In addition, switches 3,4, and 4 are used to set other module options.

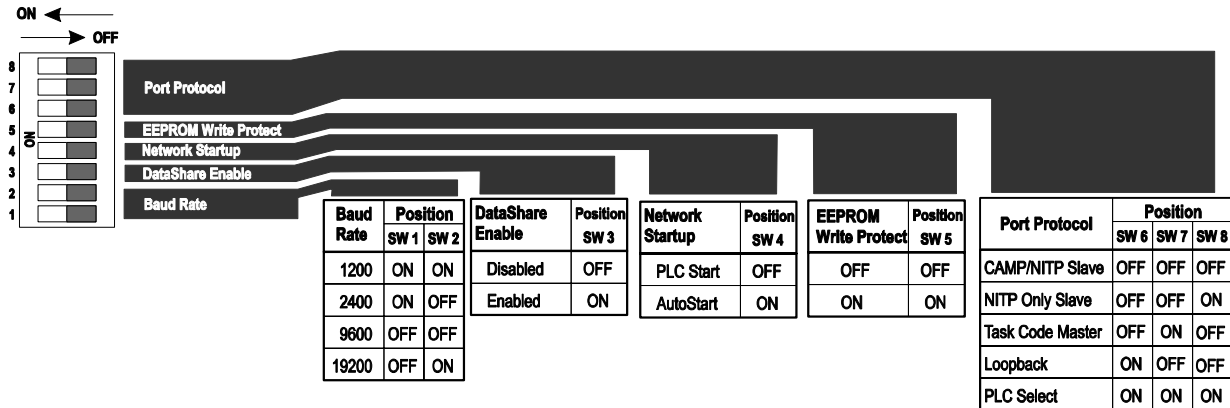


Figure 10. Switchblock 2

NOTE:

The switches on some modules may be labeled *OPEN* and *CLOSED*. The *Closed* position is equivalent to *ON*.
Switch settings not shown are reserved and should set to *OFF*.

Serial Port Protocol

Switches 6, 7, and 8 on each switch block are used to set the protocol used by the port.

Protocol	Description	Use
CAMP/NITP	Supports both CAMP (Common ASCII Message Protocol) and NITP (Non-Intelligent Terminal Protocol).	CAMP is used to transfer large blocks of data and to perform module specific functions. NITP is used by many PLC programming packages.
NITP Only	Rejects message formats that are not strictly NITP compliant.	Applications which require strict adherence to the NITP specifications
Loopback	Loopback generates a series of ASCII characters that may be directed back to the serial port via a loopback connector.	Testing serial ports and cables.
PLC Select	Allows the PLC logic to select the port protocol.	Used for custom port protocols

NOTE:

For typical operation, you should set the switches to use the *CAMP/NITP* protocol.

Serial Port Baud Rate

You can individually set the baud rate settings for each serial port. For most applications, a baud rate of 9600 provides a good balance between performance and reliability.

Port 1 Hardware Handshaking

Hardware handshaking for port 1 can be disabled or to enabled via a switch on Switchblock SW1. If hardware handshaking is enabled, the attached device must raise CTS before the 2572 will transmit data. See the diagram below. The switches on some modules may be labeled OPEN and CLOSED. The CLOSED position is equivalent to ON.

NOTE:

Unless the device you are attaching explicitly requires hardware handshaking, you should leave hardware handshaking disabled.

DataShare

Switch 3 on Switchblock 2 (SW2) enables the DataShare Protocol. When this is enabled, other protocol functions are significantly restricted. See *CHAPTER 6. DATASHARE P.*

Network Startup Options

Switch 4 on Switchblock SW2 allows you to select how the 2572 starts up the PLC Network Server function. If you set the switch to PLC START, then the 2572 will wait for the PLC to issue a Start Network Server command (see Section 2.6, page 19). The command block for this command contains the network parameters (including IP address).

If you set the switch to the AUTOSTART position, then the 2572 will *automatically* start the Network Server function, obtaining the network data from EEPROM on the 2572. The switches on some modules may be labeled OPEN and CLOSED. The CLOSED position is equivalent to ON.

Before you can use the AUTOSTART option you must store your network data in EEPROM. You can use either PLC logic or a serially attached PC with a CTI supplied program to write the EEPROM. The data will remain stored in EEPROM until changed. See page 25 for information on writing EEPROM. The IP address stored in the EEPROM has purposely been set to an invalid IP address at the factory.

Unless you have a significant reason to do otherwise, you should set the switch to PLC START and use PLC logic to start the Network Server. Then, if you swap out a module, the PLC will automatically load the new module with the correct IP address information and other network parameters. If you choose the AUTOSTART option, your maintenance procedures should guard against inadvertent module swaps, since the IP address will move with the module.

EEPROM Write Protect

Switch 5 on switchblock SW2 protects the data in the EEPROM from being overwritten. When WRITE PROTECT is on, the network parameters stored in the EEPROM cannot be changed by the PLC program or by a PC attached to a serial port. If a program attempts to write to the EEPROM when the WRITE PROTECT switch is on, the 2572 will return an error code.

See Section 2.6 on page 19 for procedures used to start the PLC network server using PLC logic. See Section 2.7 on page 120 and Section 2.8 on page 25 for information on reading and writing the module EEPROM.

NOTE:

Switchblock switch positions are read only at module startup.

The 2572 module is shipped with all DIP switches in the OFF (OPEN) position. This corresponds to:

Baud Rate	9600
Hardware Handshaking	DISABLED
Serial Port Protocol	CAMP/NITP
Network Startup Mode	PLC START
EEPROM Write Protect	PROTECT OFF
DataShare	DISABLED

2.5. Physical Installation

Inserting the Module into the I/O Base

Hold the top and bottom of the bezel and slide the module carefully into the slot, pushing it all the way into the base. If you have inserted the module correctly, you will feel a slight increase in resistance as the module mates with the base backplane connector. Once the module is fully seated in the slot, tighten the captive screws at the top and bottom to hold the module in place. To remove the module from the I/O base, loosen the captive screws, then remove the module. Take care not to damage the connector at the back of the module when inserting or removing the module.

Power Up

Turn on the base power supply. Once the 2572 diagnostics have completed and the network parameters are set, the ACTIVE indicator should illuminate. If the indicator does not illuminate or exhibits a blinking pattern, see Chapter 5 of this manual for troubleshooting information.

Checking PLC Login

Next, log the module into the PLC I/O configuration. The 2572 logs in as a special function module with 2 WX and 6 WY words. To configure the PLC I/O refer to your PLC programming software manual. In the example below, the 2572 module is installed into slot 1 on I/O base 0 and will be logged in starting at address 1. Your configuration may differ.

I/O MODULE DEFINITION FOR CHANNEL . . . 1 BASE							
00							
I/O			NUMBER OF BIT AND WORD		I/O		SPECIAL
SLOT	ADDRESS	X	Y	WX	WY		FUNCTION
01	00001	00	00	02	06		YES
02	00000	00	00	00	00		NO
..
15	00000	00	00	00	00		NO
16	00000	00	00	00	00		NO

Figure 11. Sample I/O Configuration

After you read the I/O base, if the number of WX and WY words are the same as those shown in the example above and Special function = YES, then the PLC can recognize the module. Change the address as required by your application and save the result. If the line is blank or erroneous, re-check the module to ensure that it is firmly seated in the I/O base slot. Generate the PLC I/O configuration chart again by reading the I/O base. If the problem persists, contact your distributor or contact CTI.

NOTE:

If you do not log the module in correctly, it will not function properly.

2.6. Using PLC Logic to Start the Network Server

The *Start Network Server* command is used when you want to establish the network parameters using PLC logic. When you use PLC logic to set the network parameters, you can ensure that the IP address is directly associated with the PLC and not the module.

NOTE:

Before you can use PLC logic to start up the PLC network server function, the Network Startup Option switch must be set to PLC Start (See Figure 10. Switchblock 2 on page 15).

The 2572 uses the PLC V memory to store command information and the module WX/WY words to control execution of the commands. If you are not familiar with this interface, please refer to Appendix D of this manual. Also see the ladder logic example on page 24.

NOTE:

If you store the network parameters in EEPROM and use the module AUTOSTART switch option, you are not required to execute this command.

The network data parameters are set by the PLC when the *Start Network Server* command block is executed. This block is shown on the following page. In the illustration, a **bold** entry is a required value. A non-bold entry is a *recommended* value that you should use unless you have reason to do otherwise. Values for the command block entries are shown in both hexadecimal and decimal (integer) format. Using your PLC programming software, you can configure a chart to display the values either way.

This command should be executed only when the *Network Configuration Required* bit (NET CFG) is set. The NET CFG bit is set shortly after power is first applied to the module or after the module is reset for any reason. It remains on until the network parameters have been set. If you have chosen the *PLC Start* option for network startup, you must successfully complete this command before the 2572 will respond to any other network commands. See the ladder example on page 24.

NOTE:

When you trigger the Start Network Server command, if the command block contains invalid data, the 2572 will return an error code and then halt. To recover, you must correct the command block entry and reset the module by cycling power.

Start Network Server Command Block

Offset	Description	Hex Value	Decimal Value
0	Command Error Word	0000	0
1	Command (Start Network Server)	0004	4
2	Connection Number (19291 - 19299)	4B62	19298
3	Protocol Manager Number	0023	35
4	Startup Option Bits (see description below)	0000	0
5	TCP Keep Alive Interval in Seconds (0=default = 60) (Set to 65000 or greater to disable Keep Alive)	0000	0
6	IP Address of this Module (High 16 bits)		
7	IP Address of this Module (Low 16 bits)		
8	TCP / UDP Port Number	05E1	1505
9	IP Address of Default Router (High 16 bits)		
10	IP Address of Default Router (Low 16 bits)		
11	Max Number of TCP Connections (0=default)	0000	0
12	Subnet Mask (High 16 bits)		
13	Subnet Mask (Low 16 bits)		
14	Unused - reserved for future use (Set to 0)	0000	0
15	Unused - reserved for future use (Set to 0)	0000	0

Offset 0 *Error Word* - Set to 0 so that any previous error code is cleared.

Offset 1 *Command Code* - The Command for Start Network Server is 4.

Offset 2 *Connection Number* - You should set this to number in the range of 19291 to 19299 to prevent inadvertent conflict with any client connections you may create. The value of 19298 is used in CTI examples.

Offset 3 *Protocol Manager Number* - Protocol Managers control the operation of the serial and network ports. Protocol Manager 35 (23 hex) selects the PLC Network Server.

Offset 4 *Startup Option Bits* - These bits allow you to configure certain options for the PLC server. The bits are used as follows:

Bit 1	Bit 2	Bit 3	Bits 4-16
TCP Server Disable 0 = TCP Enabled 1 = TCP Disabled	UDP Server Disable 0 = UDP Enabled 1 = UDP Disabled	Echo Server Disable 0 = Server Enabled 1 = Server Disabled	Reserved (set to 0)

TCP SERVER DISABLE - Setting this bit to 1 will disable TCP connections to the PLC server. The 2572 will reject attempts by a remote client to connect via TCP to the server. However, you can still initiate a *client* TCP connection from this PLC. A setting of 0 (TCP Enabled) is the normal mode.

UDP SERVER DISABLE - Setting this bit to 1 will disable UDP (connectionless) protocol for the server. The 2572 will reject all UDP datagrams sent to the server. However, you can still initiate a *client* UDP connection from this PLC. A setting of 0 (UDP Enabled) is the normal mode.

ECHO SERVER DISABLE - Setting this bit to 1 will disable the TCP and UDP echo servers (Port 7). TCP connection attempts and UDP datagrams directed to port 7 will be rejected by the 2572. A setting of 0 (Echo Server Enabled) is the normal mode.

You might choose to disable TCP for the server if you need additional process slots for creating client network connections. Disabling TCP frees two process slots which allows you to create two additional network connections. When you disable TCP, the server will still process UDP messages.

You might choose to disable UDP if you want to support only connection-oriented conversations. This option can provide a means to limit the transaction load on the PLC server, since you can also control the number of TCP connections allowed (see offset 11). You may also choose to disable UDP if you need an additional process slot for a TCP/IP socket. When you disable UDP, the 2572 is able to support one additional TCP server connection or PLC Client network connection.

You might choose to disable both TCP and UDP if you are using the 2572 in client mode only. Note that you must have at least one enabled 2572 server or computer host server somewhere on the network to respond to your messages. This option frees up three additional process slots.

The Echo Servers (TCP and UDP) provide a handy diagnostic tool for checking out TCP/IP communications at a level higher than Ping. You may wish to disable the Echo Servers if you need to obtain more process slots for the 2572 PLC server. Disabling the Echo servers frees up two process slots.

Unless you have a specific reason to do otherwise, use the defaults.

NOTE:

You cannot disable TCP, UDP, and the ECHO servers simultaneously. At least one must be enabled in order to start the network server.

Offset 5

TCP Keep Alive Interval - This value specifies the amount of elapsed time (in seconds) without any messages from the client application before the 2572 will automatically close a server TCP socket. If the value is set to 0, then the 2572 will use the default value of 60 seconds. To disable Keep Alive, set the value to 65,000 or greater.

- Offset 6-7* *IP Address* Offset 6 should contain the high 16 bits of the module IP address. Offset 7 should contain the low 16 bits of the IP address. An IP address of 0.0.0.0 (0000 0000 hex) or greater than 223.255.255.255 (DFFF FFFF hex) is will return an error.
- Offset 8* *TCP/UDP Port* - This will be the port number used to connect to the 2572 PLC Server application. The examples in this manual assume that this will be set to 1505 decimal. You should use this value unless you have a reason to do otherwise. A port number of 0 is invalid.
- Offset 9-10* *IP Address of Default Router* - This identifies the address of the router to which unknown IP addresses will be directed. Offset 8 contains the high 16 bits of the address and Offset 9 contains the low 16 bits. An address greater than 223.255.255.255 (DFFF FFFF hex) will return an error. If you do not have a router on your network, set this to 0.0.0.0 (0000 0000 hex).
- Offset 11* *Maximum Number of TCP Connections*- This specifies the maximum number of concurrent TCP connections to the PLC server that will be allowed. Once the maximum number has been attained, the 2572 will reject further attempts to connect until a connection is relinquished. Once a connection is properly closed, the slot is available for another connection. If you set the value in this word to 0, then the 2572 will use the default module value (8). You may set this to a number less than 8 to limit access. You may also increase the number beyond 8 as follows:
- Increase the number by 1 for each unused Client connection (Up to 8),
 - Increase by 2 if you disable the Echo Servers (see offset 4),
 - Increase by 1 if you disable UPD Server (see offset 4).
- Offset 12-13* *Subnet Mask* - Specifies the subnet mask assigned to this network. Offset 12 contains the high 16 bits of the mask and Offset 13 contains the low 16 bits. If offset 12 and 13 contain a value of 0, then the subnet mask will default to the standard for the IP address class. A subnet mask must contain all 1's in the network portion of the IP address and must allow at least 2 bits of host address. In addition, the subnet mask cannot be set so that the derived host address is 0 or a broadcast address (all bits set to 1). See Appendix D.

NOTE:

All computers on a physical network must use the same Subnet mask and Network ID; otherwise, addressing and routing problems can occur. Host ID's on the same network must be unique.

NOTE:

If you set the startup option to PLC START, you must successfully complete this command before any other network functions will execute. If you set the startup option to AUTOSTART and the EEPROM contains valid network parameters, you are not required to execute this command.

NOTE:

You must set the module startup option to AUTOSTART and reset the module before any EEPROM changes will take effect.

When you are setting up the various IP addresses and subnet mask, you should set up your PLC programming software to display the words in hexadecimal. Then you can enter each byte of the dotted notation individually. For example, if the IP address were 198.35.34.10, you could enter the first word as hex C623 where the high byte (C6) is the hex equivalent of decimal 198 and the low byte (23) is the hex equivalent of decimal 35. Similarly, you would enter the second word as hex 220A. See the following illustration.

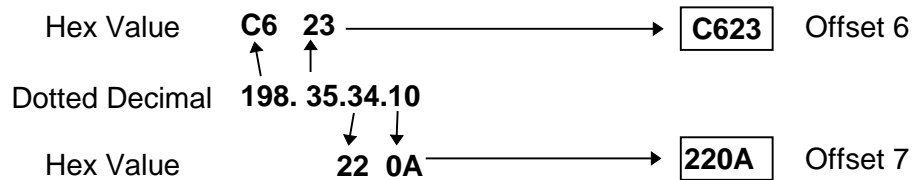


Figure 12. Representing IP Address in Hexadecimal Format

Ladder Logic Example

The following diagram illustrates the ladder logic that executes the Start Network Server command block. This example assumes that the command block is located in V memory starting at V500 and that command slot 1 is used for the command. See the *CTI 2572 PLC Command Interface Reference Manual* for details.

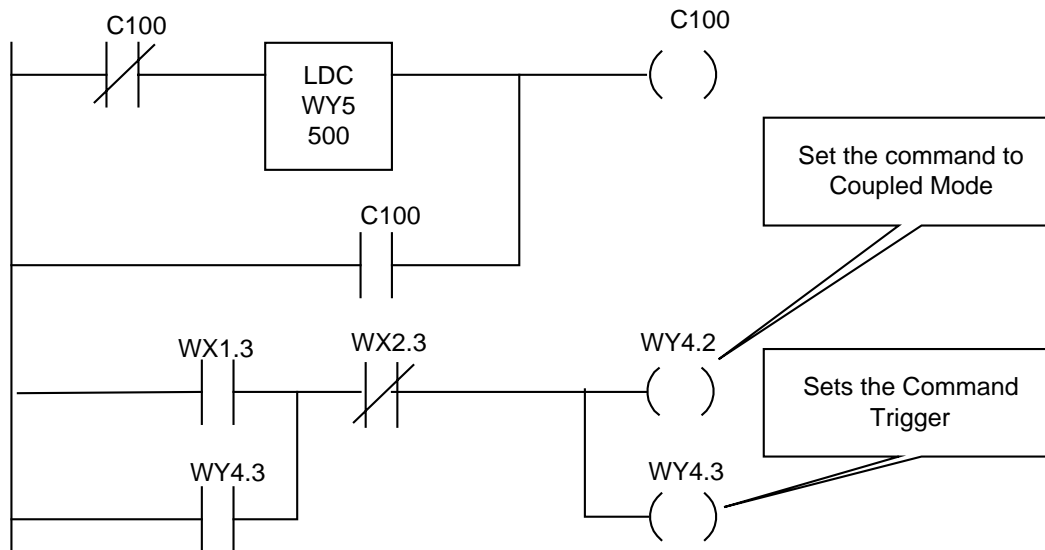


Figure 13. PLC Logic Example

Rung 1 loads the location of the Command Block (V500) into Command Slot 1 (WY5). Once the control relay is on, it seals off the command. The load command will be bypassed on subsequent scans.

Rung 2 sets the COMMAND TRIGGER (WY4.3) and COMMAND MODE (WY4.2) when the NET CFG bit (WX1.3) is on and the COMMAND BUSY bit (WX2.3) is off. When the logic sees the 2572 raise COMMAND BUSY (WX2.3), it lowers the COMMAND MODE (WX4.2) and COMMAND TRIGGER (WX4.3), completing the coupled mode cycle.

The NET CFG bit will be raised by the 2572 at any time the network configuration parameters are not set. Therefore this logic will re-execute the Start Network Server command, if the 2572 is reset for any reason.

NOTE:

Do not use retentive relays in this logic. Proper operation of this logic depends on the control relay transitioning from off to on when power is cycled.

2.7. Automatically Starting the Network Server

Storing Network Parameters in EEPROM (PC Method)

Before you can automatically start the Network Server, the network parameters, including the module IP address, must be stored in EEPROM on the 2572. You can accomplish this task using an IBM compatible PC and a utility program from CTI.

- 1) Attach the PC to Port 1 (RS-232) using a serial cable wired for RS-232. See Appendix A for a typical cable example. The cable that you use with your PLC programming software should work properly.

NOTE:

Make sure that the communications parameters set for the 2572 match those of the PC and that the CAMP/NITP protocol is selected (see section 2.4 on page 14).

- 2) Place the diskette labeled *CTI 2572 Utilities* in a 3.5" diskette drive.
- 3) Run the **IPSET** program from the diskette.
- 4) Follow the instructions on the screen for establishing the network parameters.

NOTE:

Ensure that the EEPROM Write protect switch is off (See Figure 10. Switchblock 2 on page 15.)

You can also use the IPSET program to read the network parameters contained in the EEPROM. Complete instructions for using the IPSET program can be found in the IPSET.TXT file located on the 2572 Utilities diskette.

Selecting the AUTOSTART Startup Method

Once you have completed setting the IP address, you should power down the module and ensure that Network Startup Option Switch is set to AUTOSTART. You may also wish to set the EEPROM Write Protect switch to ON. The new IP address will take effect when power is re-applied to the module.

NOTE:

*If you do not set the Network Startup Option switch to the AUTOSTART position and there is no PLC logic to set the network parameters, the IP address will **not** be set. (The module ACTIVE LED will continue to blink).*

2.8. Connecting Cables

Connecting to the 10BaseT Port

Insert the 8 pin (RJ-45) plug on your unshielded twisted pair cable into the RJ-45 jack on the 2572. Push the plug into the jack until the plug clicks into place. Attach the other end of the cable to a hub.

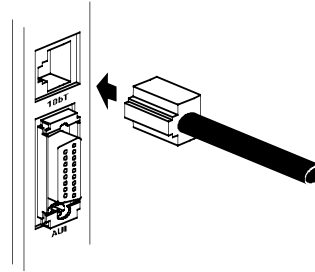


Figure 14. 10BaseT Connection

When a link beat is detected on the 10BaseT port, the 2572 automatically selects this port. When you attach a cable that is connected to an active hub, the Link Beat (LB) LED should light.

Connecting to the AUI Port

The AUI port is equipped with a standard locking connector. To attach a transceiver or AUI cable to the AUI connector:

- 1) Slide the AUI retaining ring to the full down position.
- 2) Plug the transceiver or cable into the 2572 AUI port.
- 3) Using the blade of a small screwdriver, slide the AUI retaining ring to the full up position.
- 4) Ensure that the transceiver or cable has been locked in place.
- 5) Attach the network cable to the transceiver.

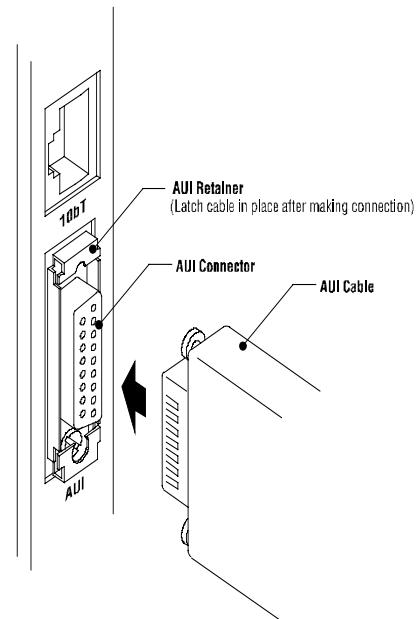


Figure 15. AUI Connection

The clearance between some transceivers and the front panel of the 2572 can make it difficult to slide the retaining ring to the locked position. In this case you may wish to connect the cable or transceiver with the module removed from the backplane. With the module removed, the retaining ring can be accessed from the rear of the front panel.

NOTE:

The AUI POWER switch must be set to INTERNAL to obtain power for the transceiver from the PLC power supply. See page Figure 8. 2572 Switch Locations on page 14.

Connecting to the Serial Ports

Port 1 provides a subset of the RS-232C electrical interface. Cables for the RS-232 ports should be no longer than 50 feet. Port 2 provides an RS-422 electrical interface. RS-422 cables may be up to 4000 feet in length.

The serial port connectors on the 2572 have been designed to accept commonly used serial cables. The pin-outs on the RS-232 port and the RS-422 port match those found on the SIMATIC TI 545 PLC. Should you choose to construct your own custom cables, please refer to Appendix A for connector pin-out descriptions.

2.9. Module Checkout

Power On

When power is applied to the 2572, the ACTIVE LED should light after about one or two seconds. If the ACTIVE LED fails to light and you are certain that power is applied, then the module hardware is defective. If the ACTIVE LED periodically cycles off and on every two seconds, it indicates that the module diagnostics have detected a hardware problem. Refer to Chapter 5 *Troubleshooting* before proceeding.

If the LED blinks rapidly (about once per second), it indicates that the network parameters (including IP address) for the module are not set. Refer to Section 2.6 on page 19 and Section 2.7 on page 120 for information on setting the parameters.

NOTE:

If you chose to obtain the IP address information from the PLC, the PLC switch must be set to the RUN position before the program can transfer the information to the 2572.

Ethernet (10BaseT Connector)

When you attach to the network using the 10BaseT connector the following should occur:

- 1) The AUI LED should extinguish and the LB (Link Beat) LED should illuminate. This indicates that a valid link beat is being obtained from the hub and that the 10BaseT port has been selected by the 2572.
- 2) If you are attached to an active network, you should see the Ethernet RCV (receive) LED flicker, indicating network signals are being received.

If the above conditions are not met, refer to Chapter 5.

Ethernet (AUI Connector)

When you are using an Ethernet transceiver attached to the AUI port you should experience the following:

- 1) The AUI LED should light and the LB LED should not be lit. This indicates that the AUI port has been selected by the 2572.
- 2) If you are attached to an active network, you should see the Ethernet RCV (receive) LED flicker, indicating network signals are being received.

If the above conditions are not met, refer to Chapter 5 of this manual.

NOTE:

If you are connected to both the AUI port and the 10BaseT port, the 2572 will automatically select the 10BaseT port if a Link Beat is received on the port. If no Link Beat signal is received on the 10BaseT port, the 2572 will automatically select the AUI port.

TCP/IP

If functioning properly, the 2572 will respond to an ICMP Echo Request message known as a *ping*. When you ping the 2572 from a network node, it should reply. If the module does not reply, make sure that you have set the module IP address properly. When converting from dotted decimal format to dotted hexadecimal format, it is easy to make a mistake.

Serial Ports

If you wish to check out the serial ports, you should attach an operator interface device which supports NITP (such as a CTI 5250 series access module) to one of the serial ports. Then send a command to the 2572 (such as a Read V Memory).

You should observe the following:

- 1) The RCV (receive) LED for the port should blink when the command is sent,
- 2) Within a second (approximately), the XMT (transmit) LED for the port should blink, indicating a response has been sent from the 2572.
- 3) The attached device should display the appropriate response.

CHAPTER 3. MODULE OPERATION

3.1. General Module Operation

When the 2572 is powered on, it performs a Power On Self Test (POST) to determine if all module components are operating properly. The test takes only a few seconds. Once the POST is complete, the ACTIVE LED should blink at a fast (2Hz) rate, indicating that the network parameters have not been loaded. Once the network parameters are successfully loaded, the ACTIVE indicator will be illuminated (on steady). If the ACTIVE LED is not lit or if it is blinking, please refer to *Chapter 5* for troubleshooting information.

3.2. Ethernet TCP/IP Operation

When the 2572 module is connected to a network that is generating Ethernet traffic, the Ethernet RCV LED should blink. This indicates that the Ethernet receiver on the 2572 senses the carrier signal.

NOTE:

*A blinking Ethernet RCV LED does **not** indicate that valid frames are being received or that frames are addressed to this 2572. It merely indicates the presence of a physical signal. When very short frames are received, the LED blink may not be noticeable. The LED blinks relate to general activity; they cannot be used to count individual frames.*

When the 2572 is transmitting Ethernet frames, the Ethernet XMT LED should blink.

NOTE:

The Ethernet XMT LED may blink periodically, even though no command requiring a response has been sent to the module. This activity is the result of TCP/IP activity such as an ARP (Address Resolution Protocol) or other ICMP message.

If you are using the 10BaseT connector, the LINK BEAT (LB) LED should be lit, indicating that the 2572 is receiving a Link Beat signal from the hub. If you are using the AUI port, the AUI LED should be lit, indicating that the 2572 module has selected the AUI port.

The COL (Collision) LED may flash occasionally, indicating that the 2572 detected a collision on the Ethernet network; light activity is normal. If the LED flash activity is frequent, your network cabling could improperly terminated or you may be experiencing excessive network traffic.

The POL (Reversed Polarity) LED should not be lit. This indicates that the cable has been improperly wired. Although the 2572 circuitry will correct for this condition, you should repair or replace the cable.

3.3. Serial Port Operation

The 2572 serial ports provide a method for configuring the module, performing diagnostic operations, and accessing the PLC memory. The 2572 module has a Transmit LED and a Receive LED for each port. When a signal is received at the port, the Receive LED will light. When a signal is transmitted from the port, the Transmit LED will light. When the port is in use, the LED's should appear to flicker.

NOTE:

The serial ports compete with the network port for access to the PLC and module resources. Heavy use of the serial ports will slow down network access. To maximize network performance, avoid using the serial ports for sustained PLC monitoring activity. Instead, consider installing a CTI 2573 module to attach the operator interface devices.

3.4. Serial Redirect Operation

The Serial Redirect function allows you to redirect PLC commands arriving at a 2572 serial port to another PLC located on the network. Using this feature you can use most PLC programming programs and operator interfaces (such as the CTI 5251) to perform remote programming and data access.

To redirect the serial port, you must execute a program named IPRDIR.EXE. This program is located on the 2572 *Utilities* diskette included with your module. The diskette also contains a text file IPRDIR.TXT that describes the use of the program in complete detail.

You may run IPRDIR from the command line or from a batch file. Once the program has been successfully executed, the NITP commands from the operator interface device or the PC program will be directed to the remote unit. All responses from the remote unit will be returned via the serial port.

CAUTION

Exercise care in redirecting the serial port. Make sure that you know which PLC you are communicating with. If you are using a DOS PC program such as TISOFT, it is best to use a batch file to:

- 1. Run IPRDIR to set the redirection,*
- 2. Run the DOS program,*
- 3. Run IPRDIR to reset the serial port to local.*

NOTE:

When the module is reset, all serial ports are always reset to Local operation. Any Serial Redirect settings will be canceled.

CHAPTER 4. CAMP CLIENT COMMANDS

4.1. Overview

The CAMP client commands are used when you wish to use PLC logic to initiate communications. This function may be used for peer to peer communications among PLCs or to send unsolicited data to your HMI application. For example, you might use this function to report alarms to a supervisory PC, avoiding the requirement to continuously poll for alarm data.

NOTE:

If you are using the 2572 in Server mode only, you can skip the remainder of this section.

4.2. Create Socket Command

The CREATE SOCKET command provides a means for your PLC logic to refer to another network node when sending messages. You must complete the CREATE SOCKET command before you can send messages to another node on the network.

The CREATE SOCKET command creates a local TCP/IP socket and associates it with the remote socket specified by the values for IP address and port in the command block. If TCP is specified, an actual logical connection to the remote node is attempted. If the connection cannot be established, the 2572 will return an error code to the PLC. If UDP is specified, the 2572 module saves the address and port number as the default remote socket, but no connection attempt is made. Once the CREATE SOCKET command completes successfully, your logic can use the Connection Number to refer to the remote socket. You can establish up to eight concurrent connections.

Create Socket Command Block

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command Code (Create Socket)	0003	03
2	Connection Number (19221 - 19228)		
3	Protocol Manager Number	0024	36
4	Startup Option Bits (see description below)	0000	0
5	Type of Service (1 = TCP, 2 = UDP)		
6	IP Address of Remote Device- High 16 bits		
7	IP Address of Remote Device - Low 16 bits		
8	Unused (Set to 0)	0000	0
9	Remote Device - TCP/UDP Port Number		
10-15	Unused (Set to 0)	0000	0

- Offset 0 *Error Word* - Set to 0 so that any previous error codes are cleared.
- Offset 1 *Command Code* - The Command Code of the CREATE SOCKET command is 03.
- Offset 2 *Connection Number* - Network Client connection numbers may range from 19221 through 19228. Any connection number within the valid range can be assigned, as long as the number is unique. Connections can be closed and re-used, if desired. To help keep track of the connection numbers, you may wish to assign connection numbers sequentially.
- Offset 3 *Protocol Manager Number* - Protocol Managers control the operation of the serial and network ports. The Protocol Manager Number for the CAMP Client protocol manager is decimal 36 (hex 24).
- Offset 4 *Startup Option Bits* - (firmware version 5.0 or greater).

Bits 1 - 14	Bit 15 - IP Address Location	Bit 16 - Client Priority
Not Used	0 = Use IP Address in CREATE SOCKET Command Block. 1 = Use IP Address in MEMORY TRANSFER Command Block (UDP Only)	0 = Normal Priority 1 = High priority

When bit 15 is set to 1 (Offset 4 = 0x0002) and the UDP protocol is selected (in Offset 5), the Command Blocks used for Memory Transfer (READ REMOTE, WRITE REMOTE, and MEMORY EXCHANGE) will specify the IP Address and Port Number for the remote device (See *Section*

4.4. Memory Transfer Commands.)

This feature allows you to use a single socket to communicate with different remote devices. When bit 15 is set to 0, the IP address and port number entered in this CREATE SOCKET command block will be used. The TCP protocol, since it is connection-oriented, will always use the IP address and port number in this CREATE SOCKET command block. If you select TCP and set bit 15 to 1, the 2572 will return an error.

NOTE:

Even if you set bit 15 to 1, you still must provide a valid IP address and Port number in the Command Block of the CREATE SOCKET command. If you don't do this, a Command Error will be generated when you execute the CREATE SOCKET command.

Bit 16 controls the priority given to this client application. When bit 16 is set to 0 (offset 4 = 0x0000), the client application will execute with a normal priority. When bit 16 is set to 1 (offset 4 = 0x0001), the client application will execute with a high priority. High priority client applications will be scheduled before all server applications and all client applications operating at normal priority. One use of the high priority setting could be sending critical alarm data. You should use normal priority unless your application definitely requires high priority.

NOTE:

Use the high priority setting with care. You can significantly degrade the 2572 network server performance by setting several client applications to high priority then continuously triggering data transfer commands for the client applications.

Offset 5 *Type of Service* - Selects between UDP (connectionless) or TCP (connection-oriented) service. Using UDP, the local socket is created but no connection is established with the target node. Using TCP, a virtual circuit connection is established with the other node. If the TCP connection cannot be established, the 2572 will indicate an error.

NOTE:

*If TCP is selected and the connection with the target node (remote host) is lost, the 2572 will report a socket connection error code (such as 240A - Socket not Connected) the next time you attempt to read/write data. The connection may be lost due to problem with the remote host or the network. After the error is acknowledged, the 2572 will complete error recovery by **automatically closing the socket**. A subsequent attempt to read/write data will result in a 00A6 (connection not active) error. See Appendix B for error code listings. Your logic should re-execute the Create Socket command if the connection is not active.*

Offset 6-7 *IP Address* - If the IP ADDRESS SELECTION option bit in Offset 4 is set to 0, these words specify the IP address of the destination node. Since the IP address consists of 32 bits, the address is contained in two 16 bit words. An IP address of 0.0.0.0 (0000 0000 hex) or greater than 223.255.255.255 (DFFF FFFF hex) will return an error

Offset 8 *Unused* - This word is not used when creating a TCP/IP socket. It should be set to 0.

Offset 9 *TCP/UDP port number* - If the IP ADDRESS SELECTION option bit in Offset 4 is set to 0, this word specifies the TCP/UDP port number of the remote node. If you are accessing another 2572, you will typically set this value to 1505 (the recommended value for the 2572 PLC server). If you are using UDP and bit 15 of offset 4 is set to 1, then this address becomes the default port number.

Offset 10-15 *Unused* - These words are unused and should be set to 0.

4.3. Close Socket Command

The following command block will close a connection to a TCP/IP socket. Once the connection has been successfully closed, you can re-use the connection number in a subsequent CREATE SOCKET command block.

Offset	Description	Hex Value	Decimal Value
0	Error Word	0000	0
1	Command Code (Close Connection)	0002	02
2	Connection Number (19221 - 19228)		
3- 15	Unused (Set to 0)	0000	0

Offset 0 *Error Word* - Set to 0 so that any previous error codes are cleared.

Offset 1 *Command Code* - The Command Code of the Close Connection command is 02.

Offset 2 *Connection Number* - You can specify any connection number that has been previously established in a Create Socket command block.

Offset 3-15 *Unused* - These words are unused by this command and should be set to 0.

NOTE:

This command can be used only for client connections. You cannot use the command to close the connection to the PLC Network Server.

4.4. Memory Transfer Commands

Memory Transfer commands are designed to provide a device independent method of transferring data words. For SIMATIC 505 PLCs, the memory transfer commands provide a simple way to transfer V memory between the local PLC and another PLC (or suitably programmed computer) on the network. These commands access only the first 64K bytes of V memory. Before using the Memory Transfer commands you must have successfully completed a CREATE SOCKET command.

Word Transfer - Write Remote

This function reads the contents of a designated area of V memory in the local PLC and writes the values in a specified area of memory in another device. You can specify the starting memory addresses on both the local and remote PLCs and the number of words to be transferred (up to 256 words). Based on the specification, the 2572 reads the local V memory and sends a message to the network recipient associated with the Connection Number. When the response is returned from the remote PLC, the 2572 verifies that the message was properly processed. If not, the 2572 places an error code in the command block and raises the applicable error bit. The following command block is used for the WRITE REMOTE MEMORY command.

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command Code (Write Remote Memory)	0201	513
2	Connection Number (19221 - 19228)		
3	Source: Starting V Memory Address in the Local PLC		
4	Number of Words to Transfer (1-256)		
5	Destination: Starting V Memory Address in Remote PLC		
6	Command Timeout in seconds (0 = Use Default)	0000	0
7 - 9	Unused (Set to 0)	0000	0
10	IP Address of Remote Device - High 16 bits (UDP Only: IP Address Location bit in the Create Socket command must be set to 1)		
11	IP Address of Remote Device - Low 16 bits (UDP Only: IP Address Location bit in the Create Socket command must be set to 1)		
12	UDP Port Number of Remote Device (UDP Only: IP Address Location bit must be set to 1)		
13 - 15	Unused (Set to 0)	0000	0

- Offset 0 *Error Word* - Set to 0 so that any previous error codes are cleared.
- Offset 1 *Command Code* - The Command Code is 513 decimal (or 0201 hexadecimal).
- Offset 2 *Connection Number* - You can specify any connection number that has been previously established in a CREATE SOCKET command block.
- Offset 3 *Source* - The starting address of V memory which contains the values you want to transfer. The address is 1 relative.
- Offset 4 *Number of Words* - This indicates the number of words you want to transfer.
- Offset 5 *Destination* - The starting address of V memory in the remote PLC that you want to update. This address is 1 relative.
- Offset 6 *Command Timeout in seconds* - When set to 0, the default value of approximately 9 seconds is selected. A value of 999 specifies an infinite timeout.
- Offset 7-9 *Unused* - Set to 0.
- Offset 10-11 *IP Address - UDP Only, firmware Version 5.0 and greater.* If you set the IP Address Location bit to 1 (see offset 4 of the CREATE SOCKET command block), you must specify the IP address of the remote device. Since the IP address consists of 32 bits, the address is contained in two 16 bit words. If the IP Address Location bit is set to 0, these words are ignored and the IP address contained in the CREATE SOCKET command block is used. An IP address of 0.0.0.0 (0000 0000 hex) or greater than 223.255.255.255 (DFFF FFFF hex) will return an error.

Offset 12 *UDP port number - UDP Only, firmware Version 5.0 and greater.* If you set the IP Address Location bit to 1 (see offset 4 of the CREATE SOCKET command block), you must specify the UDP port number of the remote device. If you are accessing another 2572, you will typically set this value to 1505 (the recommended value for the 2572 PLC server). If the IP Address Location bit is set to 0, this word is ignored and the port number contained in the CREATE SOCKET command block is used.

Offset 13-15 *Unused* - Set to 0.

Word Transfer - Read Remote

This function reads the contents of a designated area of V memory in the remote PLC and writes the values in a specified area of V memory in the local PLC. You can specify the starting V memory addresses on both the local and remote PLCs and the number of words to be transferred (up to 256 words). Based on the specification, the 2572 sends a message requesting the data to the network recipient associated with the Connection Number. When the response is returned, the 2572 verifies the response. If there is no error, the 2572 writes the data in local V memory. If an error is encountered, the 2572 will post an error which may be processed by PLC logic.

The following command block will cause the 2572 to read the designated V memory in the remote PLC and store the result in local V memory.

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command Code (Read Remote Memory)	0202	514
2	Connection Number (19221-19228)		
3	Source: Starting V Memory Address in Remote PLC		
4	Number of Words to Transfer (1-256)		
5	Destination: Starting V Memory Address in this PLC		
6	Command Timeout in seconds (0 = Use Default)	0000	0
7-9	Unused (Set to 0)	0000	0
10	IP Address of Remote Device - High 16 bits (UDP Only: IP Address Location bit in the Create Socket command must be set to 1)		
11	IP Address of Remote Device - Low 16 bits (UDP Only: IP Address Location bit in the Create Socket command must be set to 1)		
12	UDP Port Number of Remote Device (UDP Only: IP Address Location bit in the Create Socket command must be set to 1)		
13 - 15	Unused (Set to 0)	0000	0

Offset 0 *Error Word* - Set to 0 so that any previous error codes are cleared

Offset 1	<i>Command Code</i> - The Command Code is 514 decimal (or 0202 hexadecimal).
Offset 2	<i>Connection Number</i> - You can specify any connection number that has been previously established in a CREATE SOCKET command block.
Offset 3	<i>Source</i> - The starting address of V memory in the remote PLC which contains the values you want to transfer. This address is 1 relative.
Offset 4	<i>Number of Words</i> - This indicates the number of words you want to transfer.
Offset 5	<i>Destination</i> - The starting address of V memory in the local PLC that you want to update. This address is 1 relative.
Offset 6	<i>Command Timeout in seconds</i> - When set to 0, the default value of approximately 9 seconds is selected. A value of 999 specifies an infinite timeout.
Offset 7-9	<i>Unused</i> - Set to 0.
Offset 10-11	<i>IP Address - UDP Only, firmware Version 5.0 and greater.</i> If you set the IP Address Location bit to 1 (see offset 4 of the CREATE SOCKET command block), you must specify the IP address of the remote device. Since the IP address consists of 32 bits, the address is contained in two 16 bit words. An IP Address of 0.0.0.0 (0000 0000 hex) or greater than 223.255.255.255 (DFFF FFFF hex) will return an error. If the IP Address Location bit is set to 0, these words are ignored and the IP address contained in the CREATE SOCKET command block is used.
Offset 12	<i>UDP port number - UDP Only, firmware Version 5.0 and greater.</i> If you set the IP Address Location bit to 1 (see offset 4 of the CREATE SOCKET command block), you must specify the UDP port number of the remote device. If you are accessing another 2572, you will typically set this value to 1505 (the recommended value for the 2572 PLC server). If the IP Address Location bit is set to 0, these words are ignored and the port number contained in the CREATE SOCKET command block is used.
Offset 13-15	<i>Unused</i> - Set to 0.

Word Transfer - Memory Exchange (Firmware V4.7 and above)

This function is a combination of the WRITE REMOTE and READ REMOTE commands. As the name implies, it is intended to be used in applications that exchange values between two PLCs or a PLC and a PC. The command writes the contents of a block of local PLC V memory to a block of memory in the remote PLC, then reads a block of V memory in the remote PLC and writes the values to a block of V memory in the local PLC. Since this is accomplished in one transaction, it is much faster than executing separate read and write commands.

You can specify the locations of the V memory blocks in both PLCs, the number of words to be written to the remote PLC, and the number of words to be read from the remote PLC. When the command is triggered, the module in the local PLC retrieves the data from the specified memory and sends a message containing the data to the module in the remote PLC. Assuming the write was successful, the module in the remote PLC will read the specified V memory and build a reply message containing the data. When the response message is returned, the local module will write the data to the local PLC V memory.

If an error is encountered writing the data to the remote PLC, no data will be read from the remote PLC; an error message indicating the write failed will be returned. If an error is encountered reading data, an error message indicating the read failed will be returned. In either case, the module will set the applicable error bit and write the error code into the Command Error Word.

The following command block is used for the memory exchange command.

Offset	Description	Hex	Decimal
0	Command Error Word	0000	0
1	Command Code (Read Remote Memory)	0203	515
2	Connection Number (19221 - 19228)		
3	Write Source: Starting V Memory Address in Local PLC		
4	Number of Words to Write (1-254)		
5	Write Destination: Starting V Memory Address in Remote PLC		
6	Command Timeout in seconds (0=Use Default)	0000	0
7	Read Source: Starting V Memory Address in Remote PLC		
8	Number of Words to Read (1-256)		
9	Read Destination: Starting V Memory Address in Local PLC.		
10	IP Address of Remote Device - High 16 bits (UDP Only: IP Address Location bit in the Create Socket command must be set to 1)		
11	IP Address of Remote Device - Low 16 bits (UDP Only: IP Address Location bit in the Create Socket command must be set to 1)		
12	UDP Port Number of Remote Device (UDP Only: IP Address Location bit in the Create Socket command must be set to 1)		
13 - 15	Unused (Set to 0)	0000	0

Offset 0 *Command Error Word* - Your PLC logic should set this to 0 so that any previous error code is cleared. If a processing error is encountered, the module will write an error code into this word.

Offset 1 *Command Code* - The Command Code for READ REMOTE MEMORY is 515 (hex 0202).

Offset 2 *Connection Number* - Use the connection number that was established in the CREATE SOCKET command block.

Offset 3	<i>Write Source: Starting V Memory</i> - Enter the first V memory location in the <i>local</i> PLC which contains the values which you wish to write to the remote PLC.
Offset 4	<i>Number of Words to Write</i> - Enter the number of words you want to write.
Offset 5	<i>Write Destination: Starting V Memory</i> - Enter the beginning address of the V memory block in the <i>remote</i> PLC to which you want to write this data.
Offset 6	<i>Command Timeout in seconds</i> - When set to 0, the default value of approximately 9 seconds is selected. A value of 999 specifies an infinite timeout.
Offset 7	<i>Source: Starting V Memory</i> - Enter the first V memory location in the <i>remote</i> PLC from which you wish to read data.
Offset 8	<i>Number of Words to Read</i> - Enter the number of words you want to read.
Offset 9	<i>Destination: Starting V Memory</i> - Enter the beginning address of the V memory block in the <i>local</i> PLC to which you want to write this data.

NOTE:

The memory exchange command must contain at least one word to write or an error will be returned. The maximum number of words which can be written with a single command is 254. The maximum number of words that can be read is 256.

Offset 10-11	IP Address - UDP Only, firmware Version 5.0 and greater. If you set the IP Address Location bit to 1 (see offset 4 of the CREATE SOCKET command block), you must specify the IP address of the remote device. Since the IP address consists of 32 bits, the address is contained in two 16 bit words. An IP Address of 0.0.0.0 (0000 0000 hex) or greater than 223.255.255.255 (DFFF FFFF hex) will return an error. If the IP Address Location bit is set to 0, these words are ignored and the IP address contained in the CREATE SOCKET command block is used.
Offset 12	UDP port number - UDP Only, firmware Version 5.0 and greater. If you set the IP Address Location bit to 1 (see offset 4 of the CREATE SOCKET command block), you must specify the UDP port number of the remote device. If you are accessing another 2572, you will typically set this value to 1505 (the recommended value for the 2572 PLC server). If the IP Address Location bit is set to 0, these words are ignored and the port number contained in the CREATE SOCKET command block is used.
Offset 13-15	<i>Unused</i> - Set to 0.

4.5. Application Example

Start Network Server Command Block

The following command block can be used to start up the 2572 network server at IP address 192.168.177.08 (in hex notation this is C0.A8.B1.08). The server is set up to listen on TCP/UDP port number 1505. The IP address of the default router is 192.168.177.241 (hex equivalent C0.A8.B1.F1).

To enter the IP addresses, you will find it much easier to enter the values in hexadecimal format. When the V memory display is set to hex, you enter the hex equivalent of the first number in the high byte of offset 6 and the hex equivalent of the second number in the low byte of offset 6. Similarly, the third and fourth numbers in the address are entered in the high and low byte of offset 7.

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command (Start Network Server)	0004	4
2	Connection Number (19291 -- 19298)	4B62	19298
3	Protocol Manager Number	0023	0035
4	Startup Option Bits	0000	0
5	TCP Stale Socket Timeout in seconds (0=none))	0000	0
6	IP Address of this Module (High 16 bits)	C0A8	49320
7	IP Address of this Module (Low 16 bits)	B108	45320
8	TCP / UDP Port Number	05E1	1505
9	IP Address of Default Router (High 16 bits)	C0A8	49320
10	IP Address of Default Router (Low 16 bits)	B1F1	45553
11	Max Number of TCP Connections (0=default)	0000	0
12	Subnet Mask (High 16 bits)	0000	0
13	Subnet Mask (Low 16 bits)	0000	0
14	Unused - reserved for future use (Set to 0)	0000	0
15	Unused - reserved for future use (Set to 0)	0000	0

NOTE:

This command block should be executed only at module startup time. The 2572 will set the Network Configuration Required bit (WX1.3) to indicate that this is necessary.

Create Socket Command Block

This command block can be used to create a client connection to a TCP/IP socket. The socket is associated with another 2572 on the network at IP address 192.168.177.01 (hex C0.A8.B1.01) and TCP port 1505. The UDP protocol is selected.

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command Code (Create Socket)	0003	03
2	Connection Number (19221 - 19228)	4B15	19221
3	Protocol Manager Number	0024	36
4	Startup Option Bits	0000	0
5	Type of Service (1 = TCP, 2 = UDP)	0002	2
6	Remote Device - High 16 bits of IP Address	C0A8	49320
7	Remote Device - Low 16 bits of IP Address	B101	45313
8	Unused (Set to 0)	0000	0
9	TCP/UDP Port Number	05E1	1505
10-15	Unused (Set to 0)	0000	0

Depending on your application requirements, you may wish to create the socket(s) immediately after the network server is started and leave the socket active all the time. If you do not need to free up a socket for another use, you will probably select this option. Alternately, you could create the socket, send the data, and then close the socket.

NOTE:

*You should use Coupled Mode logic since you want to execute this command only once per trigger.
See Appendix D for additional information on command modes.*

Word Transfer Command Block

The following command block can be used to write 25 words from the local PLC V memory starting at V100 to the PLC associated with connection number 19221(see the previous Create Socket command). The command requests that the data be written to the remote PLC V memory starting at V200.

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command Code (Write Remote Memory)	0201	513
2	Connection Number (19221 - 19228)	4B15	19221
3	Source: Starting V Memory Address in this PLC	0064	100
4	Number of Words to Transfer (1-256)	0019	25
5	Destination: Starting V Memory Address in Remote PLC	00C8	200
6	Command Timeout in seconds (0 = Use Default)	0000	0
7-15	Unused (Set to 0)	0000	0

If you need to verify that the remote PLC (or a computer system emulating a 2572 PLC server) actually executed the request to store the data, you can monitor the error status. If a problem occurs while executing the command, the 2572 will set the CMD ERR bit and place the applicable error code in the Error Word. See *Appendix D* for additional information.

PLC Ladder Logic Example

The following pages contain a sample of a PLC ladder logic application that implements the 2572 Client Mode. Client Mode allows the PLC to send a message containing commands and/or data from the local PLC to another network node via TCP/IP. It is typically used to send unsolicited alarm messages or production data based on an event detected by the PLC. Potential message recipients include network computers or other PLCs using a 2572.

This sample application executes a START NETWORK SERVER command to set the module IP address and other network parameters. Once this command is completed successfully, the application establishes a socket to communicate with another network device using the CREATE SOCKET command.

The example command block is for UDP; however, it can be easily modified to create a TCP connection by changing one parameter in the command block. Once the CREATE SOCKET command has completed successfully, the logic will continuously execute a memory transfer command (read remote) as long as an event represented by C100 is present. Error recovery logic includes simple command logging and retry and TCP re-connection attempts.

Obviously, there is no single “right” way to accomplish this application. This example is not necessarily the most elegant or efficient alternative, but it is known to work. The logic includes error detection, logging, and recovery.

In this example, the module is assumed to be logged in starting at WX1. Thus, WX2 will contain the command status bits, WY4 will contain the command control bits, and WY5 - WY 8 will contain Command Slots 1 - 4. If your configuration is different, you will need to change the sample logic to match your configuration.

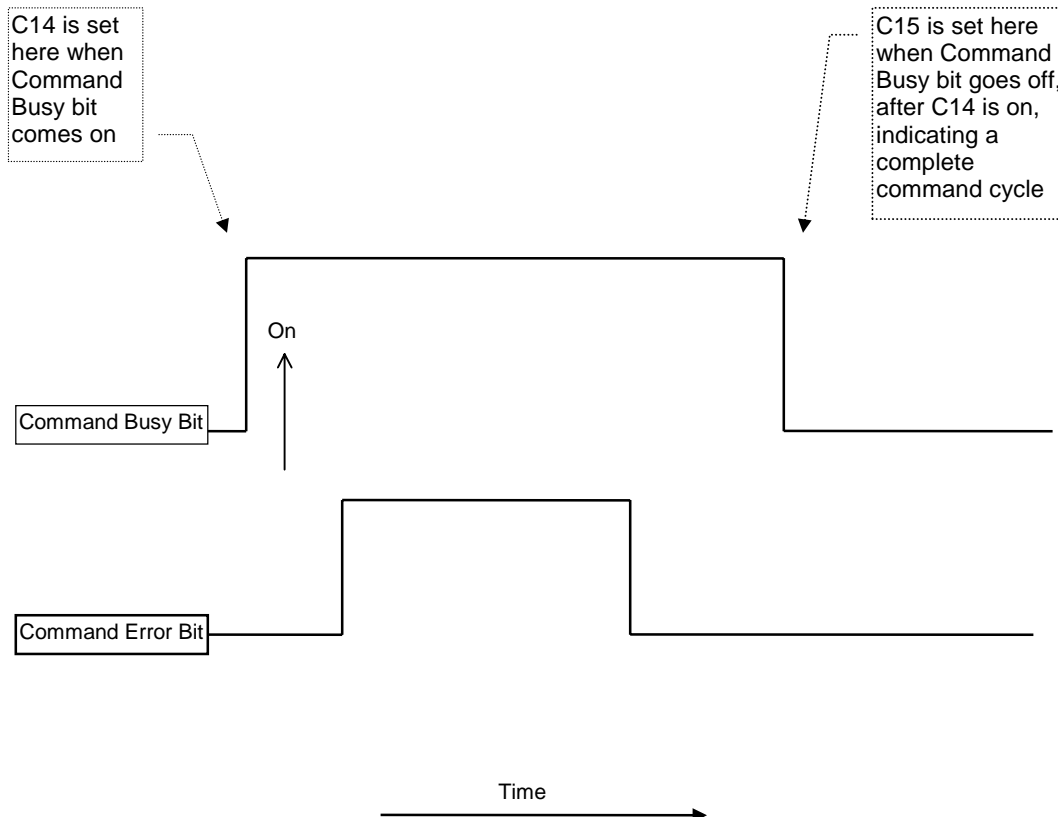
This example uses Command Slot 1 (WY5) for all commands. WY5 will contain the V memory address of Command Block being used. The state of the logic (e.g. which control relay is set) will determine which address is loaded into WY5.

The Command Blocks are assumed to be already stored in V memory. You may enter them in directly using PLC programming software, use PLC logic to copy them from K memory, or create them directly in ladder logic using the load constant box. The example uses the following Command Blocks:

Start Network Server located at V100
Create Socket located at V120
Memory Transfer located at V140.

A single rung of ladder logic is used to set the trigger for all commands for the single command slot. The trigger uses the coupled mode, which enforces “handshaking” between the 2572 and the PLC. See Appendix D for a detailed discussion of the command mode.

Note the function of C14 and C15. They are used to detect the fact that a 2572 command cycle has completed. Refer to the timing diagram below. The 2572 will raise the Command Busy bit after the PLC logic sets the command trigger. If there is no error, the 2572 will lower command busy after the PLC lowers the command trigger and the 2572 module has successfully completed the command. If there is an error, the 2572 will raise the error bit. In this case, it will not lower the command busy bit until the PLC sets the error acknowledge bit. When the command busy bit is lowered, the command cycle is complete and the 2572 can accept another command in the command slot.



Please refer to Appendix D for detailed information regarding the timing of the trigger, command busy and command error bits. C14 is used to latch the beginning of a command cycle. When the command busy bit is lowered after C14 has been set, C15 is set. When C15 is set, the command cycle has been completed.

Error recovery is a required component of any application utilizing network communications. The example error recovery is simple, but typical of what you might do.

When executing the Start Network Server command, any error usually indicates an invalid command block. The error must be manually corrected. Therefore, any errors that occur while attempting this command are not logged nor is the error word cleared.

When performing other commands (such as memory transfer), you may encounter errors that are caused by the network or the remote device with which you are attempting to communicate. For example, the remote device may go off-line. In most cases, the practical error recovery is to log the error and retry.

This example simply copies the last error to a V memory location and retries the command. The retry will repeat until the command is successful. You may wish to modify the error logic to count the number of errors/retries and to set an alarm when an error persists. You might also choose to store a set of most recent errors in a table.

Rung 5 contains error recovery specific to TCP. If the connection to the remote device is lost (due to network or remote device problems), the logic must re-establish the connection. This is accomplished by comparing the command error word of the Memory Transfer command to the value of 166. This is the error code that would be returned if the TCP connection were lost. When the command error word is equal to 166, the logic will attempt to establish the connection again.

The logic recognizes three states:

1. The Network Server application has not been started (thus the IP address has not been set) and WX1.3 is on. C1 is on; C12 and C13 are off.
2. The Network Server is active but a client network connection has not been established. Control relay C12 is turned on in this state; C1 and C13 are off.
3. The network connection has been successfully established and data transfer can commence. Control relay C13 is on in this state; C1 and C12 are off.

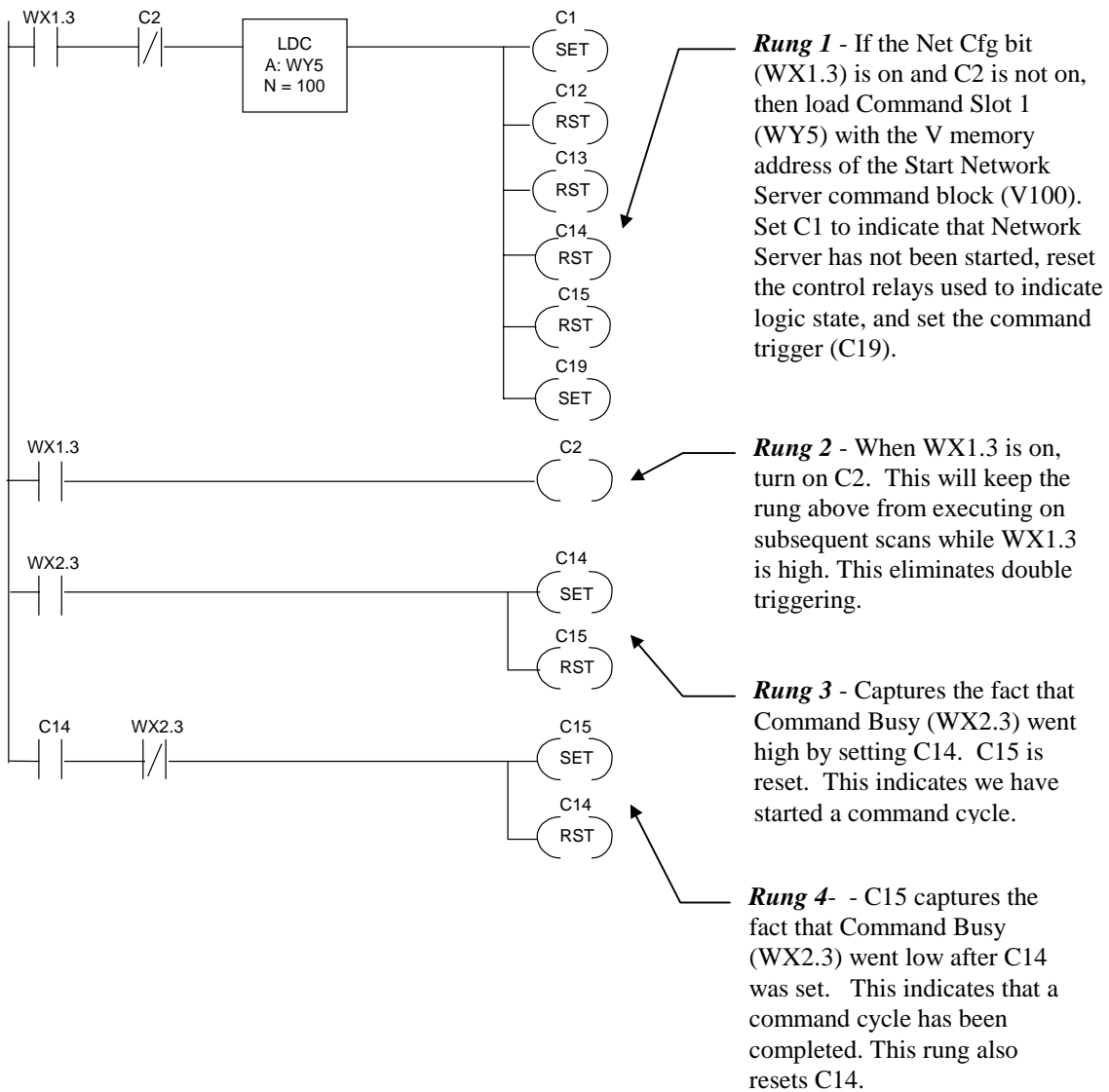
NOTE:

This example assumes you are starting the network server (and setting the IP address) using PLC logic. This method is strongly recommended by CTI. If you choose to automatically start the network server using network parameters in EEPROM, your logic will never “see” WX1.3 come on.

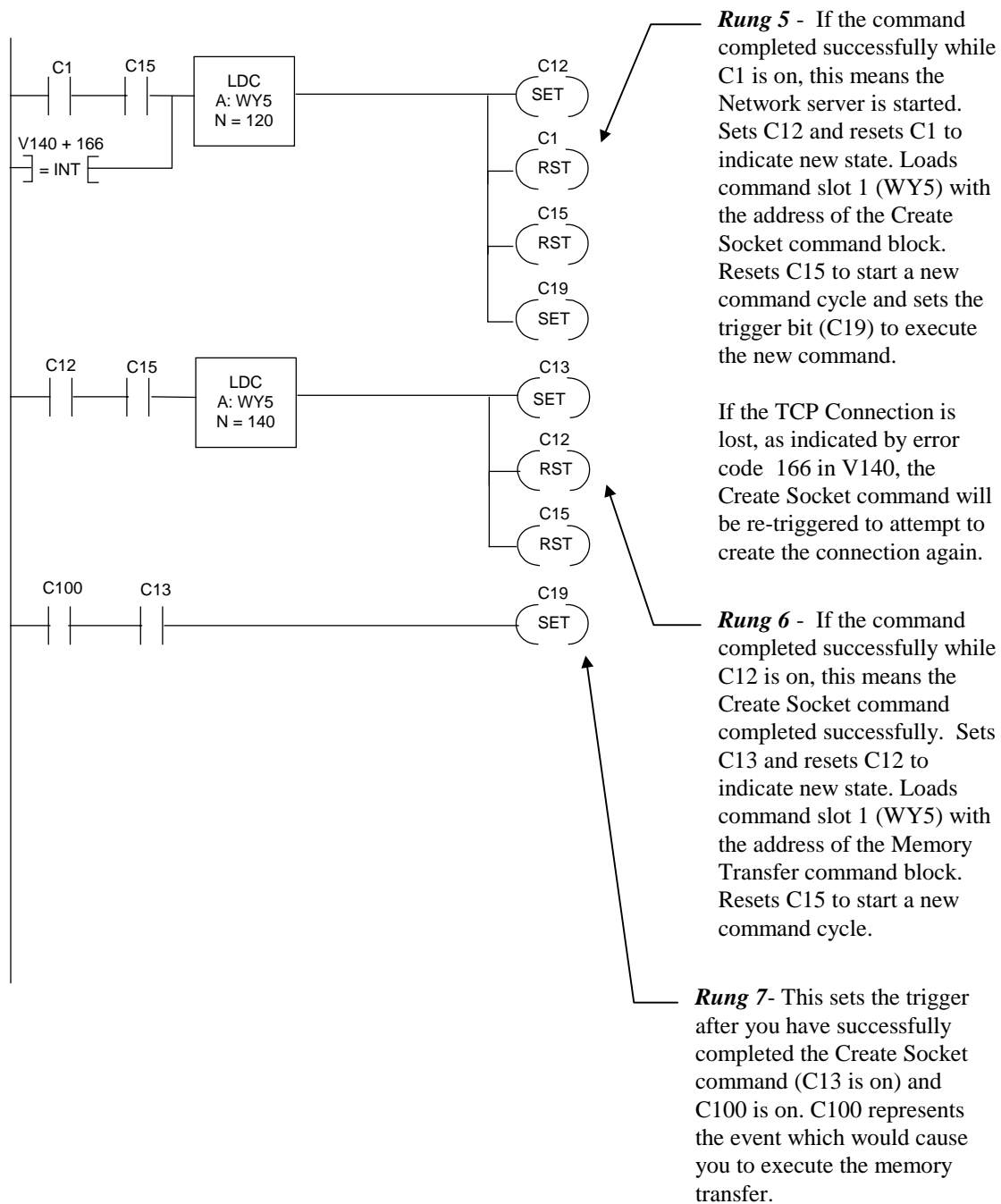
Therefore, you will need to modify the logic accordingly.

See the 2572 Installation and Operation Guide for information on startup methods.

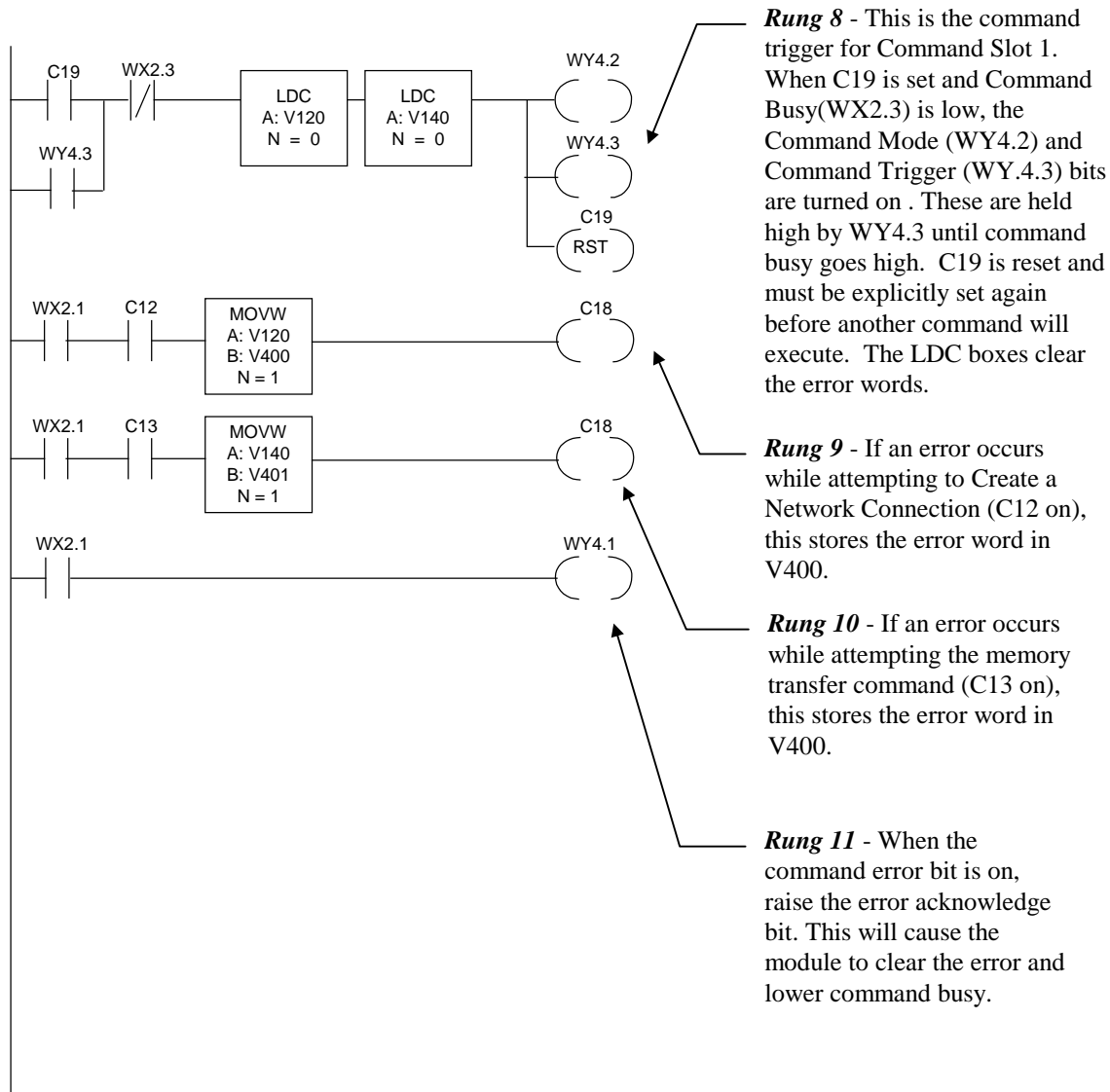
Client Ladder Logic Example: Part 1



Client Ladder Logic Example: Part 2



Client Ladder Logic Example: Part 3



CHAPTER 5. SEND-RECEIVE PROTOCOL

5.1. Overview

The TCP/IP SEND/RECEIVE protocol enables data exchange between Siemens S7/S5 Controllers and Siemens SIMATIC 505 PLCs using a 2572 TCP/IP module. In addition, it may be used to transfer data between two SIMATIC 505 PLCs equipped with 2572 modules.

SEND/RECEIVE establishes a peer-to-peer connection between PLCs. Once a connection is established between the peer-to-peer partners, either partner may send data to the other by issuing a SEND command. The receiving PLC must explicitly issue a RECEIVE command to read the data from the network buffer into the PLC memory.

5.2. Implementation

The Siemens implementation of SEND/RECEIVE works over several different transport protocols, including ISO and TCP/IP. This implementation uses the *ISO-on-TCP* transport connection, which interfaces the Siemens OSI layers to TCP/IP according to the specifications in RFC1006.

The feature introduces the OSI term “TSAP” to 2572 users. The TSAP (Technical Service Access Point) is the name given to each endpoint of a communications session. TSAPs are used in addition to the standard IP address and port number to identify a particular set of data to be transferred. Before a connection can be established between partners, the TSAP names are validated.

Unlike CAMP or MODBUS, the SEND/RECEIVE protocol includes no data type or address fields. It simply transports a block of data bytes between the PLCs. Therefore, the application programs in both PLCs must agree regarding the format of the data block. The application designer is responsible for ensuring this data consistency. When used with the 2572 module, the data format is restricted to blocks of V memory. Standard command blocks are used to establish connections and to trigger commands to send or receive data.

Data Buffering / Flow Control

Since it is possible for the logic in the sending partner to send data faster than the receiving partner reads it, a method to control the flow of data is required. This feature uses the flow control built in to TCP. TCP uses a sliding window size to communicate the amount of data that it will accept. When the TCP buffer is full, the window size will be reduced to 0, indicating to the partner that no more data will be accepted. When the data in the TCP buffer is read by the PLC, the window size is increased, indicating that additional data may be sent.

For this feature, the maximum TCP window size is set to 560 bytes, indicating that the 2572 will buffer up to 560 bytes (280 words) of data. When you send messages faster than the 505 PLC receives them, the messages are stored in the module until the PLC retrieves them. The number of messages that can be stored in the data buffer is inversely proportional to the amount of data contained in a message. When the message is large, the buffer will hold only a few messages. When the message is small, the buffer will hold many messages.

Although buffering ensures that messages are preserved, it does introduce update latency because a new message must wait until all other messages stored in the module have been read by the PLC. For many applications, the increased latency is not significant. However, if update latency is an issue, you may choose to increase the data size, resulting in a smaller number of messages in the queue or you may implement application-level logic to defer sending an additional message until the partner acknowledged receipt.

You may note that the 2572 module is capable of sending and receiving messages greater than 560 bytes. When a large message is transmitted, TCP will break the message up into multiple segments, each no larger than 560 bytes and will transmit each segment separately. The 2572 module is capable of reassembling a message sent in multiple TCP segments.

Active and Passive Partners

Send/Receive requires a point-to-point TCP connection between the communications partners. One partner is responsible for initiating the connection request while the other is responsible for accepting or rejecting the request. The partner responsible for *initiating* the request to establish the connection is called the **Active** partner. The partner that *responds* to the connection request is called the **Passive** partner. To establish a peer-to-peer connection one partner must be Active and the other Passive.

NOTE:

The connection is full duplex. Once the connection has been established, both partners may use the connection to send and receive data.

Either partner can close the TCP connection (via application logic), if required. If the Active partner closes the connection, the Passive partner will return to the state in which it is listening for request to connect at the specified TSAP. If the Passive partner closes the connection, it will cease to listen for a connection request.

The Passive partner will reject attempts to connect unless the TSAP and IP address of the requesting node match those specified in PLC logic. If an existing connection has been established, the Passive partner will close the existing connection and open a new connection if a new connection request is received where the TSAP and IP address match the specifications.

Connection Management

The protocol manager monitors the status of all connections. TCP “KeepAlive” messages are used to detect abnormal connection loss such as cable breakage or partner processor failure.

If a connection is lost when the module is the Active partner, it will automatically attempt to re-establish the TCP connection. The re-connection attempts will continue until the connection is closed by application logic or until the module is reset. If a connection is lost when the module is a Passive partner, the module will return to a state in which it is listening for the Active partner to connect at the specified TSAP. It will remain in this state until a connection is re-established or until the connection is closed by application logic. A lost connection will be reported to the PLC application only when the PLC logic attempts to send or receive data.

5.3. Send/Receive Command Blocks

The Send/Receive feature is implemented on the 2572 using the standard Command Interface. You may create up to four SEND/RECEIVE connections.

OPEN ACTIVE Connection Command

If the 2572 is designated as the Active partner, you must initiate an OPEN ACTIVE CONNECTION command using PLC logic. The OPEN ACTIVE CONNECTION command attempts to establish a connection with a designated communications partner. If the connection attempt is successful, the connection can be used for data transmission using the SEND or RECEIVE commands.

If a connection cannot be made with the designated partner, an error code will be returned to the application, and the application must explicitly retry the connection attempt. Once the connection has been established, if the connection is subsequently lost, the 2572 will automatically attempt to re-establish the connection.

NOTE:

*If you choose to open an Active connection, the partner must **not** open an Active connection. For S7 communications, ensure that the Active selection is not enabled. Configuring the 2572 as the Active partner tends to establish the connection quicker.*

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command Code	2E01	11777
2	Connection Number	4B15 – 4B1C	19221-19228
3	Protocol Manager Number	002E	46
4	IP address of Partner – High 16 bits		
5	IP address of Partner – Low 16 bits		
6	Flags	N/A	
7	Length of local TSAP (in bytes)	1-10	1-10
8	Start V-memory address of local TSAP		
9	Length of remote TSAP (in bytes)	1-10	1-10
10	Start V-memory address of remote TSAP		
11-15	Unused		

Command Code – The number for this command is 0x2E01.

Connection number – The connection number must be unique and within the designated range.

Protocol Manager Number – The number for this Protocol Manager is 0x2E.

IP Address of Partner – This is the IP address of the partner to which you want to connect. See the 2572 user documentation for the format of the IP address.

Flags – None Used

Local TSAP – This is the TSAP associated with the connection in this PLC. You may select any value but you must ensure that the value entered for Remote TSAP in the partner PLC matches this.

Remote TSAP – This is the TSAP associated with the connection in the partner PLC. You must ensure that this matches the value entered for Local TSAP in the partner PLC.

NOTE:

TSAPs are case sensitive. If the case does not match, the connection will be rejected.

Open PASSIVE Connection Command

If the 505 PLC is designated as the Passive partner, you must initiate an OPEN PASSIVE CONNECTION command using PLC logic. The OPEN PASSIVE CONNECTION command starts an instance of the protocol manager that listens for a connection request from a designated communications partner. If it receives a connection request that matches the conditions specified in the OPEN PASSIVE CONNECTION command and resources are available, it will participate with the Active partner to establish the connection. Once the connection has been established, it is ready for data transfer.

NOTE:

If you choose to open a Passive connection, the partner must open an Active connection. For S7 communications, ensure the Active selection is enabled.

Necessary conditions for a successful OPEN PASSIVE CONNECTION are:

- The connection number is within the valid range and has not already been used,
- The TSAP strings can be successfully read from V memory,
- The TSAP is not already being used by another connection.
- The TSAP pair and IP address parameters match the specification in the command block

NOTE:

Because an Open Passive connection must wait for an Active partner to connect, no error is returned if the Active partner is not present. You must access the connection with a Send or Receive command in order to detect that the partner has not connected.

The following Command block is used for OPEN PASSIVE CONNECTION

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command Code	2E02	11778
2	Connection Number	4B15 – 4B1C	19221-19228
3	Protocol Manager Number	2E	46
4	IP address of Partner – High 16 bits		
5	IP address of Partner – Low 16 bits		
6	Flags (Bypass Validity Checks = 0x01)		
7	Length of local TSAP in bytes	1-10	1-10
8	Start V-memory address of local TSAP		
9	Length of remote TSAP in bytes	1-10	1-10
10	Start V-memory address of remote TSAP		
11-15	Unused		

Command Code – The number for this command is 0x2E02

Connection number – The connection number must be unique and within the designated range.

Protocol Manager Number – The number for this Protocol Manager is 0x2E

IP Address –The IP address of the partner must match the entry in this command block (unless the bypass checks flag bit is set). The IP address should be entered in hexadecimal format, with each byte representing a dotted decimal octet. See *Figure 12. Representing IP Address in Hexadecimal Format*.

Flags – If this is set to 0x01 then the protocol manager will bypass checking the value of the Remote TSAP and the partner IP Address. This should be done only for initial testing and debugging.

Local TSAP – This is the TSAP associated with the connection in this PLC. You may select any value but you must ensure that the value entered for Remote TSAP in the partner PLC matches this.

Remote TSAP – This must correspond to the Local TSAP value in the partner PLC block (unless the bypass checks flag bit is set).

NOTE:

TSAPs are case sensitive. If the case does not match, the connection will be rejected.

SEND Command

The Send command reads a data from the designated block of V location and sends it to the partner PLC.

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command Code (SEND)	2E03	11779
2	Connection Number	4B15 – 4B1C	19221- 19228
3	Command Flags		
4	Number of words to transfer	1 - 200	1-512
5	Send Block V-memory Address		
6	Unused		
7-15	Unused		

Command Code – The number for this command is 0x2E03.

Connection number – This must correspond to an open Send/Receive connection number.

Flags – None Used

Number of Words to Transfer – This designates the number of words to be sent. The maximum number is 512 words.

NOTE:

Other Siemens PLCs may have tighter restrictions. For example, the AG_SEND and AG_RECEIVE blocks in some Siemens PLC models are limited to 240 bytes.

Send Block V Memory Address – The V memory address that contains the first word of the data block to be sent.

The SEND command may be directed to any open Send/Receive Connection. Although, the V memory location and length can be changed from one invocation of the command to the next, the user must ensure that the application in the partner PLC can properly receive and interpret the data. If no initial connection has been made or the connection has been lost, the protocol manager will return an error to the Send command. PLC logic should periodically attempt to send data until the connection has been re-established.

Receive Command

The RECEIVE command reads data from the receive buffer and places it in a designated V memory block. This data would have been written to the buffer by the partner PLC using a SEND command. There is no notification that data has been received from the partner. Typical user logic will periodically attempt to read data. If no new data is available, the error bit will be set and an error value will be returned in the Error Word.

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command Code (Receive)	2E04	11780
2	Connection Number (matches open)	4B15 – 4B1C	19221- 19228
3	Command Flag		
4	Maximum Data Block Size (in words)	1 - 200	1-512
5	Receive Block V-memory address		
6-15	Unused		

Command Code – The number for this command is 0x2E04.

Connection number – This must correspond to an open Send/Receive connection number.

Flags – None Used

Maximum Data Block Size – The maximum number of words that the data block may contain. If the actual amount of data received is less than the maximum, the remaining V memory locations will be filled with zeroes. If the partner sends more data than the maximum, the data will be truncated and an error code will be returned.

NOTE:

Because the amount of data transferred depends on the sending partner, the actual number of data bytes received is written to the first word of the Receive V memory block.

Receive Block V Memory Address – The starting V memory address of the block.

Close Connection Command

The Close Connection terminates the connection with the remote station and frees any local resources used. The Connection Number may then be re-used for another connection. If the Close Connection command attempts to close a connection that is not open, no error will be returned.

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command Code (Close Connection)	2E05	11781
2	Connection Number	4B15 – 4B1C	19221- 19228
3-15	Unused		

5.4. Application Example

Application

A Siemens SIMATIC 505 PLC is used to update a Siemens S7 PLC with process information. When the S7 receives the information, it sends status information back to the 505 PLC.

Assumptions

- The SIMATIC 505 PLC uses the 2572 as a network TCP/IP interface.
- The S7 uses a CP343-1 TCP/IP interface.
- The 2572 will be configured as the Active partner
- The S7 will be configured as the Passive partner
- The IP address of the 2572 is 192.168.1.2 (Dotted hexadecimal is C0.A8.01.02).
- The TSAP for the SIMATIC 505 connection endpoint is “PLCA”. This TSAP string is stored at V500 in the SIMATIC 505 PLC.
- The IP address of the CP343 interface is 192.168.1.3
- The TSAP for the S7 connection endpoint is “S701”. This TSAP string is stored at V510 in the SIMATIC 505 PLC.
- The 2572 will send 100 words of data obtained from V1000 – V1099.
- The S7 will reply with 10 words of status information, which will be written to V1200 – V1209.
- The 2572 module is logged into the PLC at WX1.
- No router is used on the network.

CP 2572 Command Blocks

Open Active Connection

Address	Description	Hex	Decimal
V100	Error Word	0000	0
V101	Command Code	2E01	11777
V102	Connection Number	4B15	19221
V103	Protocol Manager Number	002E	46
V104	IP address of Partner – High 16 bits	C0A8	49320
V105	IP address of Partner – Low 16 bits	0102	258
V106	Flags	0000	0
V107	Length of local TSAP (in bytes)	0004	4
V108	Start V-memory address of local TSAP	01F4	500
V109	Length of remote TSAP (in bytes)	0004	4
V110	Start V-memory address of remote TSAP	01FE	510
V111-115	Unused	0000	0

Send Data Command Block

Address	Description	Hex	Decimal
V140	Error Word	0000	0
V141	Command Code (SEND)	2E03	11779
V142	Connection Number	4B15	19221
V143	Command Flags	0000	0
V144	Number of words to transfer	0064	100
V145	Send Block V-memory Address	03E8	1500
V146-155	Reserved	0000	0

Receive Data Command Block

Address	Description	Hex	Decimal
V120	Error Word	0000	0
V121	Command Code (Receive)	2E04	11780
V122	Connection Number (matches open)	4B15	19221
V123	Command Flag	0000	0
V124	Maximum Data Block Size (in words)	000A	10
V125	Receive Block V-memory address	04B0	1000
V126	Command Timeout (0 = default) Max = 60 seconds	0001	1
V127 -135	Reserved	00000	0

505 Logic

```

X1 = input that initiates the "Open S7 Connection" sequence when it
transitions 0->1

1      ! X1      1
[-] [---:0:-----]----- (SET )
!

Loads "Open Conn" Command Block address into Command Slot 1

6      ! C9      LDC1-----+
[-] [---!          !-----]----- (SET )
!          ! A:WY5      !
!          ! N=100      !
!          !          !
!          +-----+

Skips over logic section EXCEPT when executing "Open Conn" sequence

13     ! C10
[-]/[-----]----- (SKP10 )
!

C9 TRUE = Open Command Enabled but not Executed. If "Cmd Busy" and "Cmd
Error" FALSE, set "Cmd Mode" and "Cmd Trigger" bits to execute Open Command
in Coupled mode.

15     ! C9      WX2.3 WX2.1
[-] [---]/[---]/[-----]----- *-( )
!
!
!          ! WY4.3
!          +-( )

```

When "Cmd Busy" bit = TRUE, turn off C9. When C9 is FALSE, Open Command has been triggered.

```

28      !WX2.3                                     C9
      [-] [-----] [-----] (RST )
      !

```

If "Cmd Err" bit TRUE, it indicates error occurred by processing Open Cmd. Store error, set C108 TRUE (error flag), and "Err Ack" bit.

```

34      ! C9   WX2.1  MOVW1-----+                                     C108
      [-]/[---] [---!          !-----] *-(SET )
      !          ! A:V100      !          !
      !          ! B:V1400     !          ! WY4.1
      !          ! N=1         !          +-( )
      !          +-----+

```

This rung executes if Open Command completes normally. If Open Cmd completed without error, turn off C10. If C10 is TRUE, then Open Command Sequence Active

```

48      ! C9   WX2.3 WY4.3 C108                                     C10
      [-]/[---]/[---]/[---]/[-----] (RST )
      !

```

This rung executes if error occurred while executing Open Command. If C108 TRUE (Error detected), then set C9 TRUE to retry Open Command. Turn off C108 (Error bit) and C10 (Open Cmd Seq Active).

```

59      ! C9   WY4.3 WX2.3 C108  WX2.1                                     C9
      [-]/[---]/[---]/[---] [---]/[-----] *-(SET )
      !          !          !          !
      !          ! C10      !          !
      !          [- (RST )  !          !
      !          !          !          !
      !          ! C108    !          !
      !          +-(RST )  !          !
      !

```

Label to end "Open Command" logic area.

```

!          LBL10
79      [-----] (
      )
      !

```

X3 input initiates the "S7 Receive Command" sequence. C14 is TRUE if Receive Command has been triggered but not executed. Loads "S7 Recv" Command Block address into Command Slot 1 and sets C12 (Recv Cmd Seq Active) and C107 (Recv Timer enable).

```

80      ! X3   C14   LDC2-----+                                     C12
      [-] [---] [---!          !-----] *-(SET )
      !          ! A:WY5      !          !
      !          ! N=120      !          ! C107
      !          !          !          ! +-(SET )
      !          +-----+

```

This rung triggers "S7 Receive Command" when X3 (Recv Input) transitions High when X4 (Send Input) is FALSE.

```

91      ! X3   X4   1                                     C14
      [-] [---]/[---:O:-----] (SET )
      !

```

Receive Timer used to break out of receive loop if continuous errors occur.

```

97      !C107          TMRFl-----+                               C101
      [-] [-----!          !------( )
      !          !          !
      !          ! P=    2.000 !
      !          !          !
      !C107          !          !
      [-] [-----!          !
      !          +-----+

```

Skips over logic section EXCEPT when executing "Receive Command" sequence.

```

102     ! C12                               SKP11
      [-]/[------( )
      !

```

C14 TRUE = Receive Command Enabled but not Executed. If "Cmd Busy" and "Cmd Error" FALSE, set "Cmd Mode" and "Cmd Trigger" bits to execute Receive Command in Coupled mode.

```

104     ! C14  WX2.3 WX2.1                               WY4.2
      [-] [---]/[---]/[-----*-( )
      !          !
      !          ! WY4.3
      !          +-( )

```

When "Cmd Busy" bit = TRUE, turn off C14. C14 FALSE = Receive Command has been triggered.

```

117     !WX2.3                               C14
      [-] [------(RST )
      !

```

If "Cmd Err" bit TRUE, it indicates error occurred when processing Recv Cmd. Store error, set C108 TRUE (Error flag), and "Err Ack" bit.

```

123     ! C14  WX2.1  MOVW2-----+                               C108
      [-]/[---] [---!          !-----*-(SET )
      !          ! A:V120          !          !
      !          ! B:V1405         !          !
      !          ! N=1             !          !
      !          +-----+                               +--( )

```

The Recv Cmd has completed (C14=FALSE and WX2.3=OFF). If no "Receive errors" occurred, data is moved into storage buffer. If error occurred and Receive Timer has expired (C101=TRUE), data is not transferred to storage buffer. If X4 (Send Input)=TRUE, C12 (Recv Cmd Seq) is disabled, C15 (Send Cmd Enable) is set, and C107 (Recv Timer) is reset.

```

137     ! C14  WX2.3 WY4.3 C108  MOVW3-----+   X4                               C12
      [-]/[---]/[---]/[*-]/[---!          !-*-] [-----*-(RST )
      !          !          ! A:V1000      ! !          !
      !          !          ! B:V1700      ! !          !
      !          !          ! N=25         ! !          !
      !          !          +-----+ !          !
      !          !C101          !          !
      !          +-] [-----+          ! C107
      !          +--(RST )

```

! C14 WY4.3 WX2.3 C108 WX2.1

Label to end "Recv Command" logic area.

X4 input initiates the "S7 Send Command" sequence. C15 TRUE = Send Command has been triggered but not executed. Loads "S7 Send" Command Block address into Command Slot 1. Sets C13 (Send Cmd Seq Active).

This rung triggers "S7 Send Command" when X4 (Send Input) transitions High when X3 (Receive Input) is FALSE.

Skips over logic section EXCEPT when executing "Send Command" sequence.

C15 TRUE = Send Command Enabled but not Executed. Move data to transmit into data buffer pointed to by Cmd Block (V1500).

If "Cmd Busy" and "Cmd Error" FALSE, set "Cmd Mode" and "Cmd Trigger" bits to execute Send Command in Coupled mode.

When "Cmd Busy" bit TRUE, turn off C15. If C15 is FALSE, then Send Command has been triggered.

```

219      !WX2.3                                     C15
      [-] [-----] (RST )

```

If "Cmd Err" bit TRUE, it indicates error occurred when executing the Send Command. Store error, set C108 (Error flag), and C108 (Err Ack) bits.

```

225      ! C15  WX2.1  MOVW5-----+                                     C108
      [-]/[---] [---]!                                     !-----*-(SET )
      !                                     ! A:V140                                     !
      !                                     ! B:V1410                                    ! WY4.1
      !                                     ! N=1                                     ! +- (
      !                                     +-----+
      !

```

This rung executes when the Send Command has completed without errors and the Receive input (X3) is TRUE. Logic sets Recv Cmd (C14) sequence and clears C13 (Send Cmd Seq Active).

```

239      ! C15  WX2.3  WY4.3  C108   X3                                     C13
      [-]/[---]/[---]/[---]/[---] [-----] *-(RST )
      !                                     !
      !                                     ! C14
      !                                     +- (SET )
      !

```

This rung executes when the Send Command has completed with error or when the Receive Input (X3) is FALSE. Logic sets C15 (Send Cmd Enable) to retry Send Cmd and clears C108 (Cmd Error).

```

254      ! C15  WY4.3  WX2.3   X3                                     C15
      [-]/[---]/[---]/[*-]/[-----] *-(SET )
      !                                     !
      !                                     ! C108  WY4.1!
      !                                     +-] [---]/[-+
      !                                     !
      !                                     ! C108
      !                                     +- (RST )
      !

```

Skips over logic section EXCEPT when executing "Send Command" sequence.

```

277      !                                     LBL12
      [-----] (
      !

```

S7 Configuration

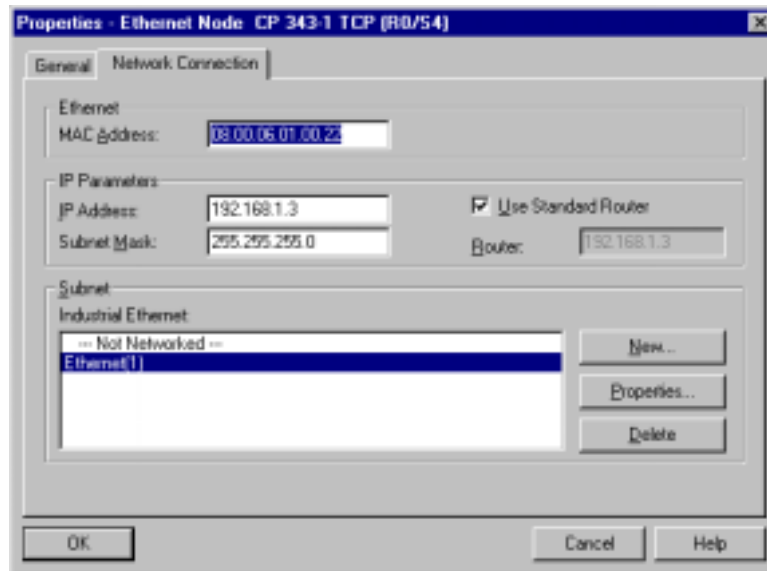
Note:

This manual assumes you are familiar with the S7 system, including installing and configuring the CP343-1 Ethernet TCP/IP module, and using the Step 7 software develop application programs. If you have questions about the S7 and related components, please contact your Siemens technical representative.

Using the Step7 configuration program, create an Ethernet subnet consisting of the S7 PLC with a CP343-1 module and an "Other" Station named CP2572. Since there is no router on this network, set the subnet default to "No Router". Then, selecting "Standard Router" under the individual node network properties will automatically select no router.

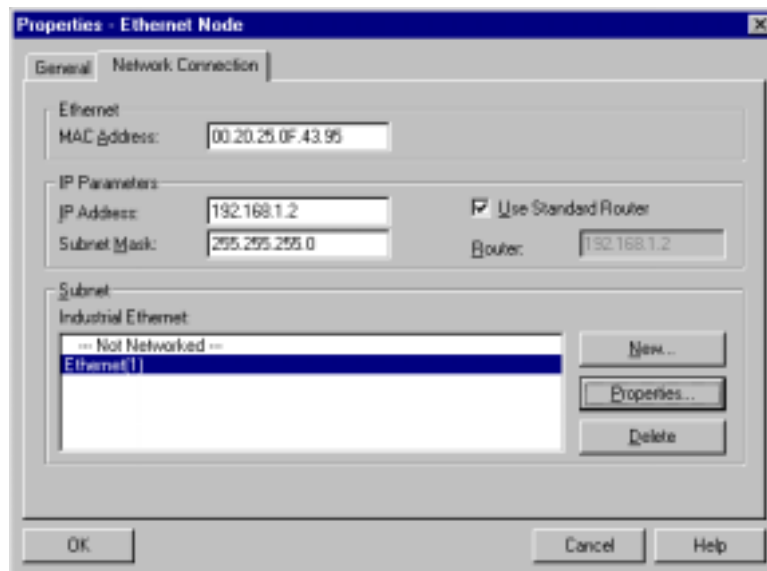
Configuring the CP343 Ethernet Module

Set the Network Connection properties of the CP343-1 module as shown below. The MAC address is not used in TCP/IP connections, but some versions of Step 7 may require an entry. In this case you may enter any arbitrary value that Step 7 will accept.



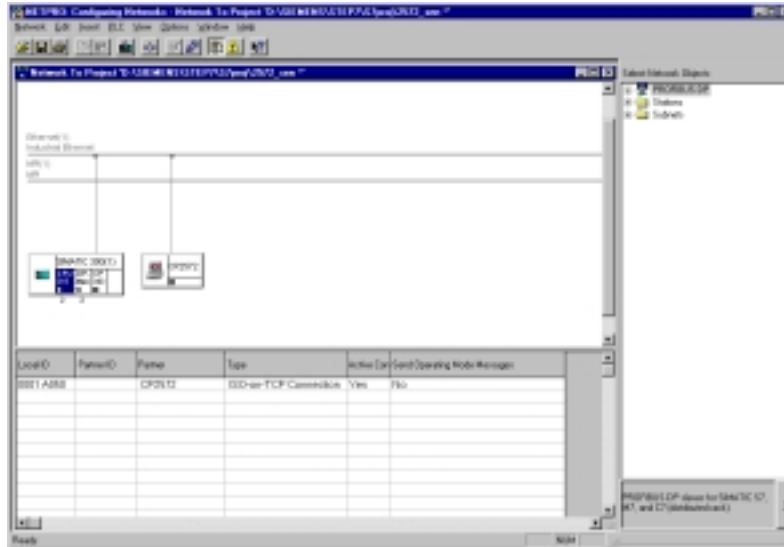
Configuring the Other Station (2572)

Enter the following Network Connection properties for the 2572 module. Again, the MAC ID is not used by TCP/IP, but some versions of Step 7 may require the entry. You may any arbitrary value acceptable by Step 7.

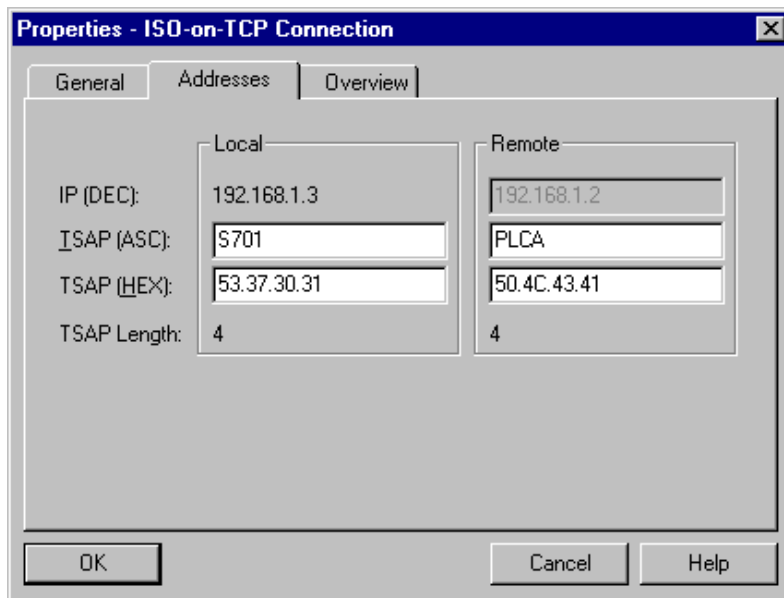


Configuring the ISO on TCP Connection

Create a new connection to the 2572 as shown below.

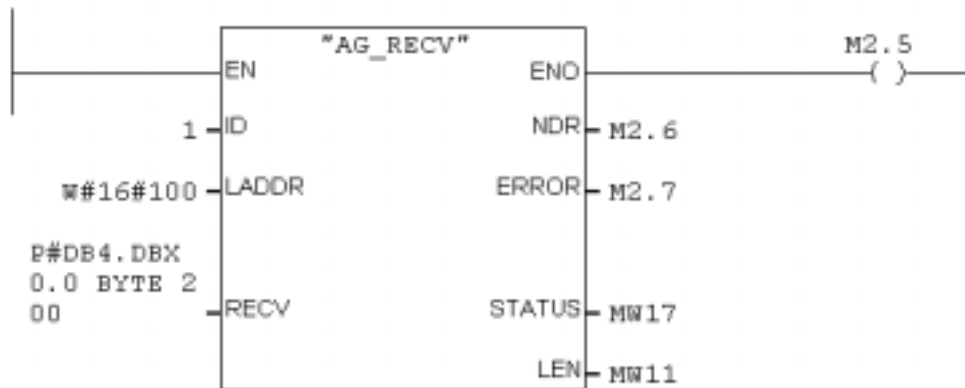


Enter the following TSAP information.



S7 Logic

The following S7 Function Block (FC6) receives data from the 2572 module. ID must correspond to the “Connection ID” in the S7 Ethernet setup. LADDR must correspond to the value shown in “Block Parameters”. RECV is memory block where the S7 writes the received data. Your S7 logic should execute this function block on a regular basis to check for input from the 505 PLC.



The following S7 Function Block (FC5) sends data to the 505 PLC. ID must correspond to the “Connection ID” in the S7 Ethernet setup. LADDR must correspond to the value shown in “Block Parameters”. SEND is memory block where the S7 obtains data to be transmitted. Your S7 logic should execute this block after receiving a message from the 505 PLC.

CHAPTER 6. DATASHARE PROTOCOL

6.1. Overview

The DataShare protocol provides a high speed data exchange among stations residing on an Ethernet local area network. DataShare is especially useful in applications where:

- One PLC needs to periodically update several others with the same set of data.
- Multiple PLCs need to interchange data on a cyclical basis.
- Built-in message receipt verification is not required

General Information

DataShare uses the Producer/Consumer model for exchanging data. Stations *produce* data by transmitting an Ethernet multicast message containing the data. Each set of data is identified by a unique Data ID located in the message. A module may be configured to *consume* a set of data containing a specific Data ID. Transmissions are limited to the same Local Area Network. Although DataShare may be used with switched hubs and bridges on the same local area network, it cannot be routed to other networks.

Since the Data ID identifies the contents of the message and each consumer is configured to consume one or more Data IDs, there is no need for the user to specify the MAC ID or the network address of modules that will consume the data. Replacing a module requires no configuration, since the Producer/Consumer configurations are part of the PLC logic.

DataShare Overview

DataShare will operate on any standard 802.3 Ethernet local area network. Rather than utilizing a higher level protocol such as TCP/IP, DataShare interfaces directly to Ethernet. Eliminating TCP/IP overhead dramatically improves performance in typical embedded systems. DataShare uses a registered Ethertype that can coexist on an Ethernet network with other protocols, including, TCP/IP, NetBEUI, IPX, and Siemens Industrial Ethernet (H1). Thus, the Ethernet network may be used for multiple purposes as long as overall performance is acceptable.

DataShare is an unconnected multicast protocol that is optimized to maximize performance and minimize update latency. Producers do not verify that a consumer is listening to the produced data. Consumers do not automatically acknowledge the consumption of a packet. Except for Ethernet collision retransmission, the protocol does not automatically retry delivery. The objective of DataShare is to deliver the most recent data to the PLC. Therefore, if a new data packet arrives before the preceding data packet can be written to the PLC, the new data will replace the old data.

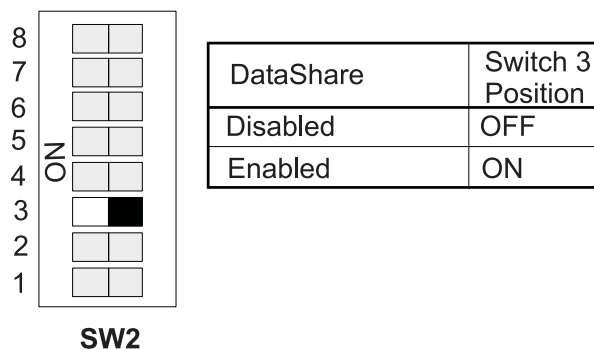
Most DataShare applications will produce data on a cyclic basis (e.g. once per scan or once per second). Thus if a packet is dropped, retry is automatic. However, application software may choose to acknowledge consumption by producing data acknowledging the receipt. In this case, application logic must re-send the packet.

A given module may produce multiple data sets and consume multiple data sets. In a typical DataShare application, each module might produce a single data set, and consume one or more data sets produced by other modules.

6.2. Implementation

Configuring the 2572 module

The DataShare facility is enabled by setting Switch 3 on Switchblock SW2 to the ON position.



When DataShare is enabled, the Ethernet transceiver is enabled for multicast and the following restrictions are imposed on the use of other protocol managers:

CAMP TCP Server:	Limited to one connection
CAMP UDP Server:	Not Available

For PLC scan times equal to or greater than 12 ms, you can start any combination of eight DataShare producer and consumer instances.

NOTE:
*For PLC scan times less than 12 ms, you should not start more than two logic triggered producers.
 See Start Producer Instance on page 67.*

Although other Protocol Managers may be started concurrently with DataShare, you should be aware that they impact performance because they compete with DataShare for module resources and access to the PLC. To avoid unacceptable performance, you should limit the number of instances started and the rate at which messages are sent.

Consumer Packet Buffering

Since DataShare is an unconnected protocol, there is no provision for flow control. Therefore, the producer(s) may generate packets at a rate that exceeds the consuming module's ability to update the PLC. In the case of an overrun condition, DataShare will deliver the most-recently-received packet to the PLC.

For each Data ID, the software will buffer one incoming packet. While one data packet has been sent to the PLC, the software will allow an incoming packet to be written to this buffer. Should another

data packet arrive before the PLC write has been completed, the incoming packet will overwrite the previous data in the buffer with the new value.

PLC Command Interface

The PLC command interface uses additional bits in the standard 505-CP2572 Module Status Word and Module Command Word structure to control scan triggered automatic DataShare production.

Bit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
WX 1	Mod Fail	Cfg Req		Diag Err	Cfg Err	AUI Act	DS Act	Resrv	Module Timer							
WX2	Standard 257x Command Status															
WY3	Rst						DS Enbl	Resrv								
WY4	Standard257x Command Control															
WY5	Standard 257x Command Slot															
WY6	Standard 257x Command Slot															
WY7	Standard 257x Command Slot															
Wy8	Standard 257x Command Slot															

DS ACT – DataShare Active: Is set whenever scan-triggered DataShare production is enabled.

DS ENBL- DataShare Enable: Must be set to enable scan-triggered automatic DataShare production. By associating this value with a discrete output point, automatic production can be halted when the PLC is placed in program mode.

6.3. PLC Command Blocks

Start Producer Instance

This command starts one instance of a producer.

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command Code (Start DataShare Producer))	2F01	12033
2	Connection Number	4B29 – 4B30	19241- 19248
3	Protocol Manager Number	002F	47
4	Option Bits	0000	0
5	Data ID (1 - 65565)		
6	MSW: Source V Memory Address		
7	LSW: Source V Memory Address		
8	Length of Data in Words (1 - 512)		
9	Trigger Option (1 = timer, 2 = logic, 3 = scan)		
10	Timer Interval (when Offset 9 = 1) Scan Interval (when Offset 9 = 3)		
11-15	Reserved, Set to 0		

Error Word - will contain an error code if an error occurs. You should set this value to 0 each time you trigger the command block to clear previous error codes.

Command Code – The number for this command is 0x2F01.

Connection Number – Connection Number must be with range and unique.

Protocol Manager Number - The number for this Protocol Manager is 0x2F

Option Bits – Reserved for Future Use. Set to 0.

Data ID - This number Identifies the data being produced. You may arbitrarily assign any number within the range; however, you must ensure that the number is unique. It should not be duplicated by other producers on the same local area or the results will be unpredictable and, most likely, undesirable.

NOTE:

The Protocol Manager cannot ensure that the Data ID is not duplicated elsewhere. You must do this manually.

MSW: Source Memory Address –Most Significant Word of the address of the V memory block that contains the data you will produce. For addresses below 65,536, set this value to 0.

LSW: Source Memory Address - Least Significant Word of the address of the V memory block that contains the data you will produce.

Length of Data - Specifies the size of the Source V memory block in words. The maximum is 512 words.

Trigger Option - Allows you to select the data production method. Option 1 will trigger production based on a time interval entered in Offset 10. Option 2 will allow you to use trigger data production in PLC logic using a Command Block. Option 3 will attempt to trigger production after the completion of the number of PLC scans specified in Offset 10.

NOTE:

If the PLC scan time is less than 15 ms, you must not start more than four producers. If the PLC scan time is less than 12 ms, you must not start more than two instances of logic triggered producers. Starting additional instances will result in erratic performance or module reset.

NOTE:

In order to enable scan triggered data production, you must set bit 7 of the Module Control Word to on. See PLC Command Interface on page 67.

Interval- If you selected a time based trigger in Offset 9, this value represents the time interval in seconds. If you specified a scan trigger in Offset 9, this value represents the number of scans between production. For example, if you set the value to 3, the producer will attempt to produce data every 3rd scan.

NOTE:

The actual data production interval may be greater than the value entered. Production may be delayed by factors such as service requests from other protocol instances or large data packet sizes that require multiple scans to update the PLC

Trigger Producer

This block is used to trigger data production. If you chose Trigger Option 2 (PLC Logic) in the START DATASHARE PRODUCER command block you must use this command. You can use this command in conjunction with other triggering methods. For example, you could configure

DataShare to produce every 10 seconds, and use the command to trigger production on a particular event.

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command (Trigger DataShare Producer)	0x2F02	
2	Connection Number (19241 – 19248)		
3	Option bits (Reserved – Set to 0)	0000	0
4 - 15	Reserved. Set to 0.		

Error Word - will contain an error code if an error occurs. You should set this value to 0 each time you trigger the command block to clear previous error codes.

Command Code – The number for this command is 0x2F02.

Connection Number – Connection Number must match to the connection number in the corresponding START PRODUCER INSTANCE command block.

Protocol Manager Number - The number for this Protocol Manager is 0x2F

Option Bits – Reserved for Future Use. Set to 0.

Start Consumer Instance

This command starts one instance of a consumer.

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command Code (Start DataShare Consumer)	2F03	
2	Connection Number		19241-19248
3	Protocol Manager Number	002F	
4	Option Bits		
5	Data ID (1 - 65565)		
6	MSW: Destination V Memory Address		
7	LSW: Destination V Memory Address		
8	Data Length in Words (1 - 512)*		
9	Starting Data Word in Data Block (1 - 512)		
10-15	Reserved, Set to 0		

Error Word - will contain an error code if an error occurs. You should set this value to 0 each time you trigger the command block to clear previous error codes.

Command Code – The number for this command is 0x2F03.

Connection Number – Connection Number must be within specified range and unique.

Protocol Manager Number - The number for this Protocol Manager is 0x2F

Option Bits – When bit 15 (0x02) is set, the lower 16 bits of the DataShare sequence number is written to the first PLC V memory Destination address. The first data word is written in the second location and other data words are offset by one.

NOTE:

When this option bit is set, the number of V memory words written will be 1 + the data length.

Data ID - This number identifies the data to be consumed. This number must match the Data ID of one of the producers.

MSW: Destination Memory Address –Most Significant Word of the address of the V memory block to which the consumed data will be written. For addresses below 65,536, set this value to 0.

LSW: Source Memory Address - Most Significant Word of the address of the V memory block to which the consumed data will be written.

Data Length - Specifies the number of data words to be consumed. You may choose to consume less data than the amount produced.

Starting Data Word - Allows you to specify an offset into the block of data being produced. For example, you may wish to ignore the first 100 words in the data block.

NOTE:

Use of the Starting Data Word, coupled with the Data Length Specification allows different PLCs to consume different parts of the same produced message. For example. PLC A may produce 300 words of control data. PLC B may consume the first 100 words, PLC C the middle 100 words, and PLC D the last 100 words. See Application Examples.

Close DataShare Instance

This command terminates the instance. The Connection Number may be re-used in a subsequent instance.

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command (Close DataShare Instance)	0x2F04	
2	Connection Number (of instance to Close)		19241-19248
3	Option bits (Reserved – Set to 0)	0000	
4-15	Reserved, Set to 0		

Error Word - will contain an error code if an error occurs. You should set this value to 0 each time you trigger the command block to clear previous error codes.

Command Code – The number for this command is 0x2F04.

Connection Number – Connection Number of Instance you are closing

Option Bits - Reserved for future use.

6.4. Master Controller Update Example

Application

One 505 PLC (PLC A) is used as a master controller, sending updates to three other 505 PLCs (PLC B, PLC C, PLC D) as fast as possible. PLC A is configured as a DataShare producer with a requested production rate of every scan. The remaining PLCs are configured as DataShare consumers.

Assumptions

- The master controller will produce 300 words of data, stored at V1000.
- PLC B will consume the first 100 words, PLC C will consume the next 100 words, and PLC D will consume the last 100 words. *Note that the consumer command blocks illustrated below are the same except for the starting data location*
- Each consumer will store the data in a V memory block starting at V2000.
- You want the consumers to write the packet sequence number in the first data location.

Command Blocks

Start Producer – PLC A

Address	Description	Hex	Decimal
V100	Error Word	0000	0
V101	Command Code (Start DataShare Producer))	2F01	12033
V102	Connection Number	4B29	19241
V103	Protocol Manager Number	002F	47
V104	Option Bits	0000	0
V105	Data ID (1 - 65565)	0001	1
V106	MSW: Source V Memory Address	0000	0
V107	LSW: Source V Memory Address	03E8	1000
V108	Length of Data in Words (1 - 512)	0064	300
V109	Trigger Option (1 = timer, 2 = logic, 3 = scan)	0003	3
V110	Timer Interval (when Offset 9 = 1) Scan Interval (when Offset 9 = 3)	0001	1
V111-115	Reserved, Set to 0	0000	0

Start Consumer – PLC B

Offset	Description	Hex	Decimal
V100	Error Word	0000	0
V101	Command Code (Start DataShare Consumer)	2F03	12035
V102	Connection Number	4B29	19241
V103	Protocol Manager Number	002F	47
V104	Option Bits	0002	2
V105	Data ID (1 - 65565)	0001	1
V106	MSW: Destination V Memory Address	0000	0000
V107	LSW: Destination V Memory Address	07D0	2000
V108	Data Length in Words (1 - 512)	0064	100
V109	Starting Data Word in Data Block (1 - 512)	0001	1
V110-V115	Reserved, Set to 0	0000	0

Start Consumer – PLC C

Offset	Description	Hex	Decimal
V100	Error Word	0000	0
V101	Command Code (Start DataShare Consumer)	2F03	12035
V102	Connection Number	4B29	19241
V103	Protocol Manager Number	002F	47
V104	Option Bits	0002	2
V105	Data ID (1 - 65565)	0001	1
V106	MSW: Destination V Memory Address	0000	0000
V107	LSW: Destination V Memory Address	07D0	2000
V108	Data Length in Words (1 - 512)	0064	100
V109	Starting Data Word in Data Block (1 - 512)	0065	101
V110-V115	Reserved, Set to 0	0000	0

Start Consumer – PLC D

Offset	Description	Hex	Decimal
V100	Error Word	0000	0
V101	Command Code (Start DataShare Consumer)	2F03	12035
V102	Connection Number	4B29	19241
V103	Protocol Manager Number	002F	47
V104	Option Bits	0002	2
V105	Data ID (1 - 65565)	0001	1
V106	MSW: Destination V Memory Address	0000	0000
V107	LSW: Destination V Memory Address	07D0	2000
V108	Data Length in Words (1 - 512)	0064	100
V109	Starting Data Word in Data Block (1 - 512)	00C9	201
V110-V115	Reserved, Set to 0	0000	0

PLC Logic

Below is typical logic to start a DataShare Producer or Consumer. This example assumes that the 505-CP2572 module is logged into the PLC I/O configuration at WX1 and command slot 1 is being used for command processing. The command block being executed begins at V100. The command is fired on the rising edge of X1. If a command error is encountered, the 2572 module will turn the error bit (WX2.1) ON. In that case, the logic turns the Error Acknowledge bit (WY4.1) ON to clear the error condition. You will need to modify this example to fit your application.

```

1      ! X1      1      LDC-----+ WX2.3      WY4.2
      [-] [---:O:---!      !-*]/[-----*- ( )
      !          ! A:WY5      ! !
      !          ! N=100      ! !
      !          !          ! !
      !          +-----+ !
      !WY4.3      !
      [-] [-----+
      !
      !WX2.1      WY4.1
18     [-] [----- ( )
      !

```

6.5. Peer to Peer Update Example

Application

There are three SIMATIC 505 PLCs controlling a process. Each PLC needs to update the other two PLCs with data so that the operation can be synchronized.

Assumptions

- Each PLC produces 100 words of data at a requested rate of every other scan.
- Data for PLC A is stored at V1000 in all controllers
- Data for PLC B will be stored at V1100 in all controllers.
- Data for PLC C will be stored at V1200 in all controllers.
- To allow each PLC data area to be identical, the Consumer Option bit to write the Sequence number to the PLC is **not** set.

The V memory map in each PLC will be identical. Each segment will be updated by one of the PLCs. See below.

Segment 1: V1000- V1099	Updated by PLC A
Segment 2: V1100- V1199	Updated by PLC B
Segment 3: V1200- V1299	Updated by PLC C

Producer Command Blocks

Start Producer – PLC A

Address	Description	Hex	Decimal
V100	Error Word	0000	0
V101	Command Code (Start DataShare Producer))	2F01	12033
V102	Connection Number	4B29	19241
V103	Protocol Manager Number	002F	47
V104	Option Bits	0000	0
V105	Data ID (1 - 65565)	0001	1
V106	MSW: Source V Memory Address	0000	0
V107	LSW: Source V Memory Address	03E8	1000
V108	Length of Data in Words (1 - 512)	0064	100
V109	Trigger Option (1 = timer, 2 = logic, 3 = scan)	0003	3
V110	Timer Interval (when Offset 9 = 1) Scan Interval (when Offset 9 = 3)	0001	2
V111-115	Reserved, Set to 0	0000	0

Start Producer – PLC B

Address	Description	Hex	Decimal
V100	Error Word	0000	0
V101	Command Code (Start DataShare Producer))	2F01	12033
V102	Connection Number	4B2A	19242
V103	Protocol Manager Number	002F	47
V104	Option Bits	0000	0
V105	Data ID (1 - 65565)	0002	2
V106	MSW: Source V Memory Address	0000	0
V107	LSW: Source V Memory Address	044C	1100
V108	Length of Data in Words (1 - 512)	0064	100
V109	Trigger Option (1 = timer, 2 = logic, 3 = scan)	0003	3
V110	Timer Interval (when Offset 9 = 1) Scan Interval (when Offset 9 = 3)	0001	2
V111-115	Reserved, Set to 0	0000	0

Start Producer – PLC C

Address	Description	Hex	Decimal
V100	Error Word	0000	0
V101	Command Code (Start DataShare Producer))	2F01	12033
V102	Connection Number	4B2B	19243
V103	Protocol Manager Number	002F	47
V104	Option Bits	0000	0
V105	Data ID (1 - 65565)	0003	3
V106	MSW: Source V Memory Address	0000	0
V107	LSW: Source V Memory Address	04B0	1200
V108	Length of Data in Words (1 - 512)	0064	100
V109	Trigger Option (1 = timer, 2 = logic, 3 = scan)	0003	3
V110	Timer Interval (when Offset 9 = 1) Scan Interval (when Offset 9 = 3)	0001	2
V111-115	Reserved, Set to 0	0000	0

Consumer Command Blocks

Start Consumer – PLC B & PLC C (Data Produced by PLC A)

Offset	Description	Hex	Decimal
V100	Error Word	0000	0
V101	Command Code (Start DataShare Consumer)	2F03	12035
V102	Connection Number	4B29	19241
V103	Protocol Manager Number	002F	47
V104	Option Bits	0000	0
V105	Data ID (1 - 65565)	0001	1
V106	MSW: Destination V Memory Address	0000	0000
V107	LSW: Destination V Memory Address	03E8	1000
V108	Data Length in Words (1 - 512)	0064	100
V109	Starting Data Word in Data Block (1 - 512)	0001	1
V110-V115	Reserved, Set to 0	0000	0

Start Consumer – PLC A & PLC C (Data Produced by PLC B)

Offset	Description	Hex	Decimal
V100	Error Word	0000	0
V101	Command Code (Start DataShare Consumer)	2F03	12035
V102	Connection Number	4B2A	19242
V103	Protocol Manager Number	002F	47
V104	Option Bits	0000	0
V105	Data ID (1 - 65565)	0002	2
V106	MSW: Destination V Memory Address	0000	0000
V107	LSW: Destination V Memory Address	044C	1100
V108	Data Length in Words (1 - 512)	0064	100
V109	Starting Data Word in Data Block (1 - 512)	0001	1
V110-V115	Reserved, Set to 0	0000	0

Start Consumer – PLC A & PLC B (Data Produced by PLC C)

Offset	Description	Hex	Decimal
V100	Error Word	0000	0
V101	Command Code (Start DataShare Consumer)	2F03	12035
V102	Connection Number	4B2B	19243
V103	Protocol Manager Number	002F	47
V104	Option Bits	0000	0
V105	Data ID (1 - 65565)	0003	3
V106	MSW: Destination V Memory Address	0000	0000
V107	LSW: Destination V Memory Address	04B0	1200
V108	Data Length in Words (1 - 512)	0064	100
V109	Starting Data Word in Data Block (1 - 512)	0001	1
V110-V115	Reserved, Set to 0	0000	0

CHAPTER 7. E-MAIL FEATURE

7.1. Overview

Electronic Mail (E-mail) has become the de-facto standard for timely distribution of information. The latest versions of E-mail servers are even capable of initiating pager messages, immediately notifying the recipient that E-mail has arrived. E-mail can be used in the plant floor environment, to notify maintenance of equipment breakdowns, inform material handling of parts requirements, and to alert production personnel of special process requirements.

The E-mail Feature allows PLC logic to initiate transmission of an E-mail message. The E-mail Feature uses the Simple Mail Transfer Protocol (SMTP), allowing the message to be processed by standard E-mail servers using TCP/IP protocol.

The 2572 E-mail feature incorporates a subset of features typically found in E-mail clients such as Eudora or Microsoft Outlook. However, the CP2572 E-mail facility is unidirectional; it can be used to send E-mail but not to receive it. The E-mail messages are composed from a series of ASCII character strings contained in PLC V memory.

There are four required character strings used by the E-mail Feature. They are:

- **LIST OF RECIPIENTS** – Contains the E-mail Addresses to which the E-mail will be sent. This information will appear under the “TO” heading.
- **The REPLY TO address** – Contains the E-mail Address to which a reply may be sent in case of delivery problems. This information will appear under the “FROM” label.
- **The SUBJECT field** – Contains user defined descriptive information. This information will appear under the “SUBJECT” heading
- **The MESSAGE field** – Contains the body of the E-mail message. This information will appear in the text portion of the message.

The maximum size of each string is 512 bytes. All literal strings in V memory must be terminated by a carriage return (0x0D). If you wish to embed a carriage return within the message, you must enter two backslash characters “\\” instead of the carriage return. The heading labels “TO”, “FROM”, and “SUBJECT” will be generated by the protocol manager.

7.2. 2572 Command Block

The E-mail Feature is implemented using the standard 505-CP2572 command interface. A single command block is used to initiate the E-mail client, establish the connection to the E-mail server, transfer the message, and close the connection.

Send E-mail Command

Offset	Description	Hex	Decimal
0	Error Word	0000	0
1	Command Code (Send E-mail)	2D01	11521
2	Reserved	0000	0
3	Reserved	0000	0
4	IP address of Mail Server – High 16 bits		
5	IP address of Mail Server – Low 16 bits		
6	V memory address of E-mail Recipient List		
7	V memory address of Reply To address		
8	V memory address of Subject field		
9	V memory address of Message string		
10	Contents of Status Word 141		
11	Contents of Status Word 142		
12	Contents of Status Word 143		
13	Contents of Status Word 144		
14	Signed offset from GMT (<= +/-12)		
15	Unused		

Command Code - for this command is 0x2D01

IP Address of Mail Server– Required in order to establish a connection to the target mail server. This is the dotted decimal address expressed in hexadecimal format.

V memory address of the Recipient List - Address of the character string containing the recipients to whom the E-mail will be sent. The character string is delimited by a carriage return. Multiple recipients must be separated by white space or a comma. Following is a sample string containing the recipient list: abc@companya.com ,bcd@companya.com

V memory address of Reply to address – Address of the character string containing the Reply Address account name. Since the 2572 module is not equipped to receive E-mail, this field identifies an E-mail account to which the recipient may reply. It may also be used by the mail server for delivery problem notification. This might be E-mail address of a process supervisor. Following is a sample string: supervisor@mycompany.com. This string will appear in the FROM field of the message.

V memory address of Subject field - This character string will appear in the SUBJECT field of the E-mail. It can be used to identify the source of the message, for example: Zone A Controller Alert. You may also use the field to identify the subject.

V memory address of Message string – This string contains the body text of the message. For Example: Pump 3 has failed. Send Maintenance.

Contents of Status Words 141- 144 – These locations are used to pass the contents of the PLC real time clock to the E-mail protocol manager. These values, in conjunction with the GMT offset, will

be used to time stamp the message. The PLC logic must copy the contents of the status words to the command block.

NOTE

If the V memory offsets 10–13 contain erroneous data, the date will be wrong. If you encounter Email date problems, check the values in these fields. See the SIMATIC 545/555/575 Programming Reference manual for the Status Word format.

Signed offset from GMT – This field contains the local time zone adjustment relative to Greenwich Mean Time (GMT). See the following table for continental US Time Zones.

EST	EDT	CST	CDT	MST	MDT	PST	PDT
-5	-4	-6	-5	-7	-6	-7	-6

7.3. Application Example

Application

The application sends E-mail to designated service personnel when a critical problem is detected in the process. A critical problem includes loss of coolant, overheated bearing, or low air pressure.

Assumptions:

- IP Address of the local E-mail Server is 192.168.1.1. Expressed in dotted hexadecimal this value is C0.A8.01.01.
- Recipient List is stored at V1000. It includes *jdoe@ABCcompany.com* and *dsmith@ABCcompany.com*
- Replies will be directed to *bjones@ABCcompany.com*. This REPLY TO string is stored at V1200.
- The subject field will be stored at V1300. The subject will be used to identify the controller detecting the problem. In this case the subject will be *Zone 1, PLC A – Pump Station*.
- The body text will describe the error. There are three text strings stored at V1400, V1500, and V1600. The string “*Low coolant level detected in main reservoir*” begins at V1400; the string “*Bearing over temperature-motor 7*” begins at V1500; and the string “*Low air pressure at feed 3*” begins at V1600. PLC logic will update the command block with the appropriate V memory address.

NOTE:

The E-mail feature does not support embedding actual data values in the E-mail text.

- Contents of the PLC status words 141-144 will be copied to the command block by PLC logic. The message is sent on 12/15/1999 at 3:10PM.
- The time zone is Eastern Standard Time (GMT – 5).
- The module is logged into the PLC starting at WX1.

Command Block

V Memory Address	Description	Hex	Decimal
100	Error Word	0000	0
101	Command Code (Send E-mail)	2D01	11521
102	Reserved	0000	0
103	Reserved	0000	0
104	IP address of Mail Server – High 16 bits	C0A8	
105	IP address of Mail Server – Low 16 bits	0101	
106	V memory address of E-mail Recipient List	03E8	1000
107	V memory address of Reply To address	04B0	1200
108	V memory address of Subject field	0514	1300
109	V memory address of Message string	*	*
110	Contents of Status Word 141	*	*
111	Contents of Status Word 142	*	*
112	Contents of Status Word 143	*	*
113	Contents of Status Word 144	*	*
114	Signed offset from GMT (<= +/-12)	FFFB	-5
115	Unused	0000	0

* Updated by PLC logic

PLC Logic

C5 is used to condition the word move in the rung below. This rung forces C5 to always be on.

```

1      ! C5
      [-]/[-*-----C5
      !
      ! C5 !
      [-] [-+

```

The date/time information from Status Words 141, 142, 143 and 144 is copied into the corresponding V memory locations in the command block every PLC logic scan

```

4      ! C5      MOVW-----+
      [-] [---! !-----C10
      !          ! A:STW141 !
      !          ! B:V110   !
      !          ! N=4      !
      !          +-----+

```

C1000, 1001, and 1002 have been programmed as the alarm bits for the alarm conditions. When one of the alarm bits goes true, the pointer to the desired message string to be sent in the E-mail is moved into V109 of the command block. The one-shot allows the message to only be triggered on the first transition of the alarm bit to true to prevent sending the message multiple times. The pointer to the Send E-mail command is moved into command slot 1 (WY5) and C19 is set to enable the command trigger

```

10      C1000    1      LDC-----+      LDC-----+      C19
      [-] [---:O:---!      !-*!      !------(SET )
      !          ! A:V109      ! ! ! A:WY5      !
      !          ! N=1400      ! ! ! N=100      !
      !          !          ! ! !          !
      !          +-----+ ! +-----+
      !C1001    2      LDC-----+ !
      [-] [---:O:---!      !-]
      !          ! A:V109      ! !
      !          ! N=1500      ! !
      !          !          ! !
      !          +-----+ !
      !C1002    3      LDC-----+ !
      [-] [---:O:---!      !-+
      !          ! A:V109      !
      !          ! N=1600      !
      !          !          !
      !          +-----+

```

This is a typical 257x trigger ladder rung.

```

36      C19      WX2.3      WY4.2
      [-] [-*-/[------*-( )
      !          !          !
      !WY4.3!      ! WY4.3
      [-] [-+      [- ( )
      !          !
      !          ! C19
      !          +- (RST )

```

This rung acknowledges an error if the error bit is set.

```

52      !WX2.1      WY4.1
      [-] [----- ( )
      !

```

Resulting E-mail

From: bjones@ABCcompany.com.
Sent: December 15, 1999 @ 3:10PM
To: jdoe@ABCcompany.com;dsmith@ABCcompany.com
Subject: Zone 1, PLC A - Pump Station

Low coolant level detected in main reservoir

CHAPTER 8. TROUBLESHOOTING

8.1. General Troubleshooting Techniques

If you experience a problem in communicating with the module, consider the following troubleshooting guidelines:

1. Make sure that the module is operational (see *Section 5.2* below). Common problems include not logging in the module to the PLC and not loading the PLC parameters properly. If you notice a problem in this area, you must correct it before proceeding further.
2. Check the network cabling (see *Section 5.3* below). If you are using 10baseT, the LB indicator must be lit. If you are using 10base2, make sure that the cable is connected and terminated properly. If you are using a transceiver attached to the AUI port, make sure that the transceiver is receiving power. If you are experiencing intermittent problems, ensure that the 802.3 limitations for segment length and number of segments have not been exceeded. You may also need to check the cable quality with the applicable tester.
3. Check the network address settings. The Network ID portion of the address must match for all nodes on the local network and the Host ID portion must be unique. Use the Ping utility to determine whether TCP/IP at the lowest level can send and receive data from the module. Observe the module LED's to determine if signals are being sent and received.
4. If your local network is connected to other networks via a router, check to ensure that the router network addresses are set properly and that all hosts on the local network are using the same subnet mask, if subnetting is used. See *Appendix D*.
5. If you are using a computer application to access the PLC via the 2572, check the application for errors in sending the commands. You should also check to determine if the 2572 PLC Server Error Word (available if you started the 2572 PLC network server via PLC logic) contains any "information only" error values related to the application commands. See *PLC Server Error Codes* on page 102. A common problem is requesting data outside the configured PLC address range.
6. If you are using the 2572 Client function, check the applicable error word for an error value.
7. If you are unable to determine the problem using the above techniques, you may need to capture network traffic using a network analysis tools. In the past, this usually required an expensive network "sniffer". Today you can acquire an inexpensive analyzer program from CTI that can assist you in capturing and interpreting the captured data.

8.2. General Module Problems

When the 2572 is reset, it performs a Power On Self Test (POST) to determine if all module components are operating properly. This test takes only a few seconds. Once the POST is complete, the ACTIVE LED should blink at a fast (2Hz) rate, indicating that the network parameters have not been loaded. Once the network parameters are successfully loaded, the ACTIVE indicator will be illuminated (on steady).

If a problem is detected with the 2572 hardware, the ACTIVE indicator will cycle off and on periodically, as the module performs a reset and attempts to correct the problem. If the network parameters have not been loaded, the ACTIVE indicator will remain blinking.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Active Indicator never lights.	No Power to Module.	Ensure that power is supplied to the rack and that the module is securely inserted.
	Defective Module.	Cycle the power. If the ACTIVE LED never lights, replace the module.
Active Indicator slowly cycles off and on.	The 2572 diagnostic program has detected a defective module component.	Cycle the power. If the problem persists, replace the module.
Active Indicator flashes quickly (approx. twice per second).	<p>The 2572 network parameters have not been loaded and the PLC server function has not been started.</p> <p>Note: The PLC Server function must be started before the module will communicate via TCP/IP.</p>	<p>Check the following:</p> <p>If you are using PLC logic to set the network parameters, make sure that the Network Startup switch is in the PLC START position, the PLC is in Run mode, and that there are no errors in executing the Start Network Server command.</p> <p>Make sure that you provide enough time for the module to complete startup operations before you execute the Start Network Server command.</p> <p>If you are using EEPROM, make sure that the Network Startup switch is in AutoStart and that the EEPROM contains valid data.</p>
Active Indicator flashes quickly (approx. twice per second) and serial ports do not function.	The 2572 has not been logged into the PLC.	Configure the PLC I/O base for the module.

8.3. Network Communications Problems

Most of the problems you encounter with the Ethernet network data link will probably be associated with cabling problems. The LEDs on the 2572 can help you locate the problem source. If you are connected to an active network you should see the Ethernet Receive LED flash. Note that this LED detects all traffic not just packets directed to module address.

Symptom	Probable Cause	Corrective Action
The Link Beat LED does not light when you connect to the 10BaseT port. The 10bT port is not selected.	The opposite end of the cable is not connected to a hub.	Plug the opposite cable end into an Ethernet hub.
	The cable is faulty or the RJ45 connector is improperly wired.	Test the cable for continuity and proper connection. Replace the cable or re-install connectors as required. Substitute a cable known to be good.
	The hub is not generating a link beat signal.	Some hubs can be configured for local area networks that do not use a link beat. Ensure that the hub is properly configured and that the power is applied to the hub.
The Link Beat LED is on but the Ethernet Receive LED does not flash	There is no traffic on this portion of the network.	Check connections to the hub. <i>Note: Very short Ethernet frames may fail to light the LED</i>
The Ethernet receive light does not flash when the AUI port is active (AUI Transceiver is being used).	The transceiver on the AUI port may not be receiving power from the module. Cabling may also be faulty; see above. <i>Note: Very short Ethernet frames may fail to light the LED</i>	Most transceivers have a power LED. If this is not lit, check the AUI Power source switch. Unless you are using an external supply or using a self powered transceiver, the switch should be set to INTERNAL.
	The cabling is faulty.	Check the cabling and the connector. Substitute a known good cable.
	The cabling may be faulty or improperly terminated	Check all connections thoroughly.
	If you are using a hub- based topology, the hub may be defective.	Check the hub for proper operation.

Symptom	Probable Cause	Corrective Action
The COLLISION LED flashes frequently and throughput is degraded.	The network is experiencing excessive traffic.	If the situation persists, isolate this segment of the network by installing a router or bridge.
The COLLISION LED flashes frequently when using 10Base2 cabling	The coax cable is not terminated properly or the transceiver is defective.	Correct cabling and/or transceiver problems.
The POLARITY LED is lit.	This indicates that the cable is mis-wired.	Although the 2572 will correct for the problem, you should still repair or replace the cable.
When use a PC program to "Ping" the module, the Ethernet RCV LED lights but you get no response.	You have incorrectly set the IP address of the module or have entered the wrong address in the ping command.	Make sure that the IP address is set (module ACTIVE LED is not blinking) Ensure that the network portion of the IP address used in the module matches the network portion of the IP address of the PC.
Same as above, except the RCV LED does not light.	The PC software is not operating properly or there is no network route to the module.	Try to "Ping" other TCP/IP nodes. If unsuccessful, correct software or routing.
The module responds to a "Ping", but when you try to access PLC data, you get no response.	The module is not logged in properly to the PLC.	Use the PLC programming software I/O configuration function to properly log in the module.
Throughput appears to be degraded.	The module is not getting enough access to the PLC.	Ensure that the number of task codes per scan is set as high as possible (preferably eight). Ensure the module is installed in a local base and that the module is installed in the first slot in the rack. Throughput will be degraded in a remote base.
	The requested data is highly fragmented in the PLC, requiring many random access transactions.	Copy fragmented data to/from contiguous V memory. This allows efficient block reads and writes.
	You have many clients accessing a single 2572 causing an excessive transaction load.	Reduce the client poll rate or amount of data requested. Split the load among multiple 2572's.
	You are making heavy use of the Client function in combination with the Server function.	Don't trigger the Client command more often than required. Split the load among multiple 2572's

8.4. Serial Communications Problems

The most common sources of signal problems are bad cables and improperly configured operator interface devices. The RCV and XMT indicators can be a valuable aid in troubleshooting these errors.

If the RCV indicator for a serial port does not flash briefly when you attempt to send data to the 2572, no signal is being received by the module. First, determine that the operator interface device is indeed sending data (refer to the operating manual for the applicable device). If the operator interface is sending data, then you probably have a defective cable. The cable may have broken wires or connectors or it may be improperly wired. The best way to troubleshoot this is to substitute a known good cable. Refer to the wiring diagram in Appendix A of this manual to check if the cable is properly wired.

If the XMT indicator for a serial port flashes briefly, it indicates that a signal is being sent from the 2572 port. If the XMT indicator flashes but no signal is received at the operator interface device, then there is most likely a cable problem. Follow the procedure outlined above for checking cabling problems.

If the XMT indicator does not flash within 2 seconds of receiving a signal (RCV indicator flashes), it indicates that the 2572 is not responding to the signal. Refer to sections below for possible causes.

Baud Rate Mismatch

First, check to ensure that the baud rate settings on both the Model 2572 and the operator interface are set to the same data rate. If you note a problem, set both to the same baud rates and retry.

Hardware Handshaking Error

If you are using an RS-232 port and your device is NOT configured for hardware handshaking, ensure that hardware handshaking is DISABLED.

If you are using an RS-232 port and your device is configured for hardware handshaking, ensure that the handshaking wires are properly connected (see the documentation for the connected device). In some cases you can check out a handshake wiring problem by temporarily setting hardware handshaking to DISABLED (port DIP switch position 3 set to the OFF position). If the 2572 responds to the attached device (XMT LED flashes), then you probably have a wiring problem.

Protocol Problems

If the serial port does not work and cabling/configuration items discussed in other sections above have been checked, then you probably have a protocol problem. To respond to module commands (such as Serial Redirect) and NITP, the module dipswitches must be set properly, see page 9 regarding module switch settings.

To access the PLC, the attached device must issue and respond to task code packets as defined in the Non-Intelligent Terminal Protocol (NITP) .

Intermittent Serial Communications Problems

If you experience intermittent communications failures, you may be experiencing noise on the communications cable which interferes with data transmission or you may have a faulty cable. You should ensure that you have not exceeded the maximum distances for cabling lengths. Also check for proper grounding of the cable shields; we recommend connecting the shield at one end only. Longer cable runs may be subject to ground loops; you may require the addition of an electrical isolation device.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
RCV Indicator does not flash when attempting to send data from a device attached to the serial port.	No signal is being received by the 2572. This is probably due to a defective cable. It may be due to a faulty device or, if you are using a PC, a faulty communications card.	Check the communications cable wiring. Replace with a known good cable and retry. If failure still occurs, try another device or communications card.
The RCV Indicator flashes. No signal is received by the attached device AND the 3572 XMT does not flash.	No signal is being transmitted by the 2572 on this serial port. Check the following:	
	Baud Rate Mismatch.	Correct baud rate settings on the device or the module.
	Hardware Handshaking Mismatch. The 2572 is waiting on the attached device to raise the handshake line before sending.	Enable hardware handshaking on the attached device or DISABLE hardware handshaking on the 2572.
	Cable is not wired for hardware handshaking and Hardware handshake is enabled in the 2572	Check cable for proper wiring. Temporarily DISABLE hardware handshake on the 2572 to test results.
	Module is not logged in to the PLC	Configure the PLC I/O base.
No signal is received by the attached device AND the 2572 XMT light flashes.	This is probably due to a defective cable. It may be a defective device.	Replace cable with one known to be good. Try an alternate device.
Intermittent Communications Problem.	Communications "noise."	Reduce the baud rate on the 2572 and the attached device and retry. Re-route or replace cabling.

8.5. PLC Logic Problems

As described previously, the Command Block located in V memory specifies the command to be executed. The Command Slots (WY5-WY8) select which Command Blocks are to be processed. The Command Control bits trigger the execution of the commands. A mistake in setting up and/or manipulating these structures will cause erroneous results. Fortunately, the 2572 module provides extensive error reporting which should assist you in correcting logic problems. See Appendix A for a complete description and typical solutions to resolving the errors.

Following are some common errors in using the PLC interface to the 2572.

Command Block Errors

When you are first setting up the command blocks in V memory, it is easy to enter incorrect data into the command block or to omit data from the command block. Some mistakes, such as an invalid command or port number will be obvious, because the 2572 will return an error when they occur.

Command Slot Errors

Other errors can occur if you enter the wrong V memory address for the Command Block or when you omit entering an address. If you enter a V memory address which does not contain a valid command block or enter an address of 0, the 2572 will raise the PLC ERR bit as well as the CMD ERR bit. No error code will be written, since there is no valid location in which to write one.

NOTE:

A command block is considered invalid if offset 2 (Connection Number) does not contain hex 4B is the high byte of the word. This signature byte places all connection numbers are in the range of 19201-19299 decimal (4B01-4B63)

You might enter a V memory address of a *valid* command block, but it is *not* the command block you want to process. In this case, you will probably not get an error, just the wrong result.

Command Control Errors

One common error in manipulating the Command Control bits is a failure to assert ERR ACK (Error Acknowledge) after the module has raised the CMD ERR (Command Error bit). If you fail to acknowledge the error, the associated command slot will appear to "lock up" on the command slot. In actuality, the module software is waiting on the PLC acknowledgment before proceeding. You can tell that the module is not really locked up by observing the timer value in the lower byte of module WX1 increment and that you have a Command Error by examining the applicable error bit. In addition, if you have triggered other commands, they will continue to operate (unless an error also occurs on these command slots).

Another potential error is failing to observe the timing protocol for coupled mode. You must wait for the module to assert CMD Busy and then lower CMD Trigger. Failure to observe the timing may cause the command slot to appear to "lock up". Actually the module is waiting to see the PLC lower the CMD trigger. See *Appendix D* for timing details.

Errors in manipulating the Command Control bits may cause "multiple triggering," resulting in an error code. Certain commands, such as those to create a connection, must be run only once. Improperly constructed PLC logic may repeatedly trigger the command, resulting in an error code such as 0x00A7 (duplicate connection).

8.6. Development and Debugging Tips

Manual Triggering

You can test your command blocks independently from the PLC logic that actually executes them by manipulating the command control bits manually. First, place the PLC in program mode so that the PLC logic will not be executing. Then you can manipulate the bits as shown below. If you are not familiar with the 2573 PLC Command Interface, you should refer to *Appendix D*.

The command control bits are located in the 4th module word. For example, if you logged the module in starting at Word 1, then the command control bits will be located in WY4. See the *WX/WY Quick Reference* in *Appendix C* of this manual. There are 4 sets of control bits, one set for each command slot. Any command slot can be used in any order.

WY4	Bits 1 -4	Bits 5 - 7	Bits 8 - 11	Bits 12 -16
	Command Control Bits - Slot 1	Command Control Bits - Slot 2	Command Control Bits - Slot 3	Command Control Bits - Slot 4
	Hex 0-F	Hex 0 - F	Hex 0 - F	Hex 0 - F

Within each set of four Command Control bits:

- The first bit is the Error Acknowledge,
- The second bit is the Command Mode bit,
- The third bit is the Command Trigger,
- The fourth bit Abort Trigger.

So a bit pattern of 0110 will set the command mode bit and the command trigger. Similarly, the bit pattern 1000 will set error acknowledge. Using hexadecimal notation is a convenient way to observe and manipulate these bits, because each hexadecimal digit represents 4 bits. Thus, bit pattern when command trigger and command mode are high (0110) is represented by hexadecimal 6 (0+4+2+0). Similarly, an error acknowledge bit high (1000) is represented by hexadecimal 8.

The command status bits written by the module are located at the second module word (WX2 in this example) in a bit grouping that matches the command control word.

WX2	Bits 1 -4	Bits 5 - 7	Bits 8 - 11	Bits 12 -16
	Command Status Bits - Slot 1	Command Status Bits - Slot 2	Command Status Bits - Slot 3	Command Status Bits - Slot 4
	Hex 0-F	Hex 0 - F	Hex 0 - F	Hex 0 - F

Within each set of four Command Status bits:

- The first bit is the Command Error bit,
- The second bit is the PLC Error bit,
- The third bit is the Command Busy bit,
- The fourth bit is the Abort Busy bit.

Therefore, to set a command trigger only (uncoupled mode) for the first command slot, set WY4 to hex 2000. To set the command trigger for the second slot, set the WY4 to hex 0200. To set the error acknowledge for the third Command Slot, set WY4 to hex 0080.

When you are using PLC logic to control the PLC, it is often useful to display the module WX/WY words, parts of the command blocks, and sections of the format specifications as a chart. Following is an example chart.

LOCATION	STATUS	LOCATION	STATUS	LOCATION	STATUS
WX1 =	HEX	V100 =	HEX	V300 =	HEX
WX2 =	HEX	V101 =	INTEGER	V301 =	INTEGER
WY3 =	HEX	V102 =	INTEGER	V302 =	INTEGER
WY4 =	HEX	V103 =	INTEGER	V303 =	INTEGER
WY5 =	INTEGER	V104 =	INTEGER	V304 =	INTEGER
WY6 =	INTEGER				
WY7 =	INTEGER	V120 =	HEX	V2000 =	INTEGER
WY8 =	INTEGER	V121 =	INTEGER	V2001 =	INTEGER
		V122 =	INTEGER	V2002 =	INTEGER
		V123 =	INTEGER	V2003 =	INTEGER
		V124 =	INTEGER	V2004 =	INTEGER
				V2005 =	INTEGER

The above chart allows you to examine at the value of the module status word (WX1), the command status word (WX2), the module control word (WY3), and the command control word (WY4) in hex. It also displays the command slots (WY5-WY8) as integers. V100, V120, and V140 are assumed to contain command blocks you are using; this display shows the first four words, including the error word in hex format. V2000 is assumed to contain data you wish to monitor. Change the display to match your setup.

To trigger a coupled mode command for command slot 1 (Assuming the module is logged at Word 1-8):

1. Enter the Command Block data in V memory.
2. Enter the address of the Command Block in WY5.
3. Change the value of WY4 to hex 6000. WX2 should change to hex 2000, indicating that the module is executing the command.
4. If WX2 changes to hex 2000, set the value of WY4 to hex 0000 (clears the trigger). If WX2 eventually transitions from hex 2000 to hex 0000, the command was executed successfully.
5. If WX2 changes to hex A000, a command error was encountered. Acknowledge the error by changing WY4 to hex 8000; then clear error acknowledge by setting WY4 to hex 0000. Inspect the command error word (Command Block - Offset 0), correct the error, and repeat the operation.
6. If WX2 changes to hex E000, you have entered an incorrect address in WY5 or you have an invalid connection number in the Command Block. Acknowledge the error as described in step 5 above and repeat the operation.

APPENDIX A. 2572 CONNECTORS

RS-232 Connector (Port 1)

Use communications cable that complies with RS-232C requirements. Since this pinout of this port matches the IBM PC compatible standard, you should be able to locate standard cables. If you wish to construct custom cables, please refer to the following diagram. Connect shield wire at one end only.

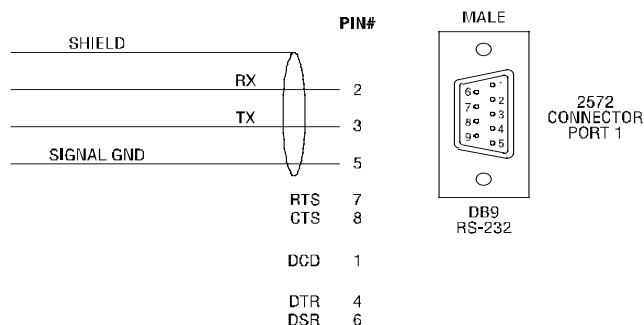


Figure 16. RS-232 Connector Pin-Out

RS-422 Connector (Port 2)

Use a communications cable that complies with RS-422 requirements. RS-422 uses two shielded twisted pair signal wires and a ground. Please refer to the following diagram if you wish to construct custom cables. Connect shield wire at one end only.

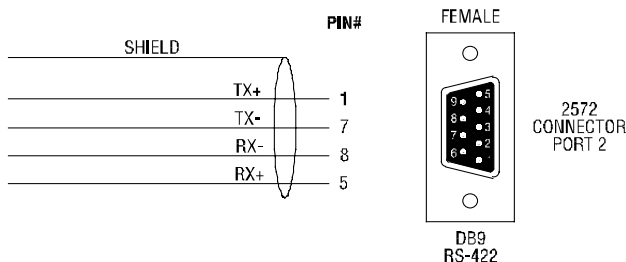


Figure 17. RS-422 Connector

10BaseT Connector

Use unshielded twisted pair cables that comply with the IEEE 802.3 Type 10BaseT standard.

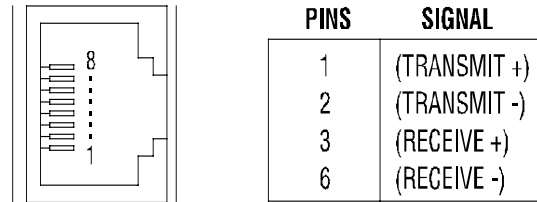


Figure 18. 10BaseT Connector

AUI Connector

Use transceivers or cables that comply with the IEEE 802.3 standard for Attachment Unit Interface.

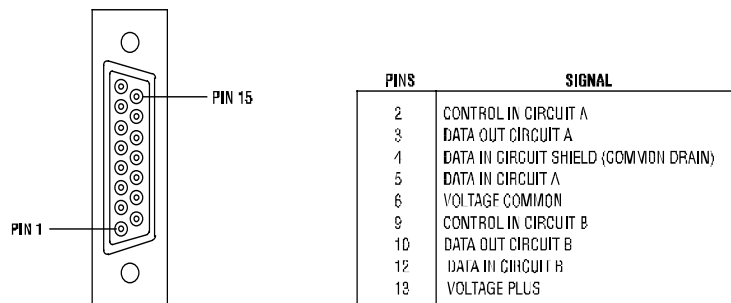


Figure 19. AUI Connector

AUI Power

Attach an external power supply capable of supplying at least 500ma at 12 VDC. This connector is not fused; however, it is diode protected. When you are using external power, ensure that the AUI power switch on the 2572 is set to EXTERNAL.

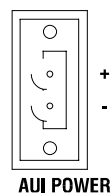


Figure 20. AUI Power Connector

APPENDIX B. ERROR CODES

When the 2572 encounters an error condition, it raises the CMD ERR bit and places an error word in Offset 0 of the Command Block. Following is a list of the errors in numerical order.

2572 System Error Codes

The following error codes may be returned by the 2572 operating system. They are almost always the result of invalid data in the command block or faulty PLC logic. All system error codes begin with hex 00.

HEX	DEC	DESCRIPTION	SOLUTION
0086	134	INVALID LOCAL IP ADDRESS The IP address cannot be 0.0.0.0 or greater than 223.255.255.255 (DFFF FFFF)	Correct the data in the Command Block. (Write EEPROM Command)
0087	135	INVALID TCP/UDP PORT NUMBER The port number cannot be 0.	Correct the data in the Command Block or command message. (Write EEPROM Command)
0088	136	INVALID DEFAULT ROUTER ADDRESS The default router address cannot be greater than 223.255.255.255 (DFFF FFFF hex)	Correct the data in the Command Block. (Write EEPROM Command).
0089	138	CANNOT RE-DIRECT PORT The serial port could not be redirected because the port protocol has been improperly selected.	This may occur when you have improperly set the module serial port switches, causing the wrong protocol to be loaded. Set the module switches to select the NITP/CAMP server protocol. See Chapter 2.
008A	139	INVALID TYPE OF SERVICE The Service Type for IP must be either: 1= TCP or 2=UDP	Correct the data in the Command Block. (Serial Redirect Command)
008B	140	INVALID REMOTE IP ADDRESS You specified an IP address greater than 223.255.255.255 for the redirected port.	Correct the data in the Command Block. (Serial Redirect Command)
008C	141	PORT ALREADY REDIRECTED You attempted to redirect a serial port that was already redirected.	You must first end the current redirection by setting the serial port to local (IP = 0.0.0.0). Then you can redirect. You may get this error if you inadvertently trigger the serial re-direct command block twice. If so, correct your PLC logic.

HEX	DEC	DESCRIPTION	SOLUTION
008D	142	MAXIMUM CONNECTIONS EXCEEDED You attempted to create more TCP client connections than the 2572 will support.	You cannot create more than 8 TCP Client connections.
0097	151	INVALID COMMAND While attempting to execute a system command, you specified an invalid command number.	Correct the Command Number in the Command Block.
009E	158	ALREADY BUSY You attempted to send a command to a function that was already busy executing a previous command.	You can cause this error by using two command slots to send commands to the same connection number. Don't do this.
009F	159	INVALID CONNECTION NUMBER You specified a connection number that is out of the valid range.	See the documentation for the particular command block. Correct the connection number as required.
00A5	165	INVALID SYSTEM COMMAND Connection number 19200 (system) was specified in the command block but the command is not a valid system command.	Change the logical port to a valid connection number or the command number to a valid system command.
00A6	166	CONNECTION NOT ACTIVE An attempt was made to send a command to a connection number that has not been created. Note: you could receive this error if you incorrectly entered the connection number in the memory transfer command block.	Check the following for the Create Socket Command: 1) Make sure that the command block contains the correct data, 2) Ensure that the Command Slot points to the proper command block, 3) Ensure that the Command Trigger has been set. 4) Check for reported errors for the Create Connection Command. Check the Memory Transfer command block for an incorrect connection number entry.
00A7	167	DUPLICATE CONNECTION NUMBER An attempt was made to create multiple sockets with the same connection number. or You attempted to Start the 2572 Network Server and it was already started. or You attempted to Start the 2572 Network Server after a previous startup error had been returned.	Ensure that all Create Socket commands for serial ports use different connection numbers. Make sure you are not triggering the Start Network Server Command more than once or that you have not already started the network server using the dipswitch AUTOSTART setting. If an error occurs when starting the network server, you must correct it and reset the module.

HEX	DEC	DESCRIPTION	SOLUTION
00A8	168	DUPLICATE CONNECTION NUMBER An attempt was made to start two protocol managers with the same connection number.	Check the Command Blocks for the respective Create Connection commands. Ensure that the Create Connection commands use different connection numbers.
00A9	169	INVALID PROTOCOL MGR NUMBER You entered an invalid protocol manager number in the Command Block.	Review the documentation and correct the command block.
00AA	170	INVALID PORT NUMBER An attempt was made to start a protocol manager with an invalid physical port number for serial ports. This can also occur when you specify an invalid serial port number for the Serial Redirect Command.	This error will occur if you enter an invalid physical port number in the command block. Valid physical port numbers for the 2572 serial ports are 1 or 2. Correct the command block and retry the command.
00AE	174	NETWORK NOT INITIALIZED You attempted to execute a CREATE SOCKET command before the 2572 network server has been started.	If you are using the PLC Start option, the Start Network Server command was not executed successfully. Check for the proper execution of this command including the command block and PLC logic for this command. If you are using the AutoStart option, ensure that the network parameters are properly stored in EEPROM. You can use the CTI IPSET program to examine this.
00AF	175	EEPROM WRITE PROTECT WARNING The EEPROM Write Protect switch is ON. You cannot write to the EEPROM	If you want to write the EEPROM, set the EEPROM Write Protect switch to OFF.
00B0	176	EEPROM HARDWARE WRITE ERROR The 2572 was unable to write data to the EEPROM	Retry. If the problem persists, replace the module.
00B1	177	EEPROM HARDWARE READ ERROR The 2572 was unable to read data from the EEPROM	Retry. If the problem persists, replace the module.
00B2	178	INVALID V MEMORY ADDRESS The Command Block contained a V memory address of 0.	Correct the Command Block data.
00B3	179	INSUFFICIENT V MEMORY RESERVED You failed to reserve enough V memory to hold the data returned by the command.	Correct the Command Block data.

General Memory Transfer Error Codes

HEX	DEC	DESCRIPTION	SOLUTION
026F	623	<p>REMOTE MEMORY READ: WORD COUNT ERROR</p> <p>The remote device (PLC) responded with fewer words than requested by the Remote Memory Read command block.</p>	<p>This error usually occurs when the number of words requested in the command block causes the read request to exceed the memory boundary in the remote PLC. In other words, you are trying to read memory that isn't there.</p> <p>You should examine the Command Block and correct either the number of words requested or the starting memory location for the remote device.</p>
0271	625	<p>NUMBER OF WORDS OUT OF RANGE - LOW</p> <p>The Command Block contained a zero or a negative value for number of words. The valid range is 1-256 words.</p>	Correct the value in the Command Block
0272	626	<p>NUMBER OF WORDS OUT OF RANGE - HIGH</p> <p>The Command Block contained a value greater than 256 for number of words. The valid range is 1-256 words.</p>	Correct the value in the Command Block
0273	627	<p>BAD OR MISSING DELIMITER</p> <p>The <i>receiving</i> device detected a bad or missing delimiter in the command message</p>	<p>This error usually indicates a transient error in the data link. You should retry the command.</p> <p>If the receiving node is a computer simulating a 2572 PLC server, ensure that the software is correctly processing the message.</p> <p>If the error persists contact CTI.</p>
0274	628	<p>BAD BLOCK CHECK CHARACTER</p> <p>The <i>receiving</i> device found the block check character to be bad.</p>	See error code 0273.
0275	629	<p>INVALID TYPE</p> <p>The <i>receiving</i> device reported an invalid TYPE character in the message.</p>	See error code 0273.
0276	630	<p>INVALID DATA CHARACTER</p> <p>The <i>receiving</i> device reported an invalid data character. Only characters 0-9 and A-F are allowed.</p>	See error code 0273.
0277	631	<p>ODD NUMBER OF CHARACTERS</p> <p>The <i>receiving</i> device reported an odd number of characters in the message. All CAMP messages have an even number of characters.</p>	See error code 0273.
0278	632	<p>INVALID DEVICE CODE</p> <p>The <i>receiving</i> device reported an invalid device code in the message.</p>	See error code 0273.

HEX	DEC	DESCRIPTION	SOLUTION
027A	634	INVALID DEVICE CODE The 2572 detected an invalid device code in the response from the remote device	This error may result from a transient error in the data link. You should retry the command. If the problem persists, check the quality of the data link. If the remote node is a computer simulating a 2572 PLC server, ensure that the software is correctly creating the response the response message
027B	635	BAD OR MISSING DELIMITER The 2572 detected a missing delimiter in the response message	See error code 027A.
027C	636	BAD BLOCK CHECK CHARACTER The 2572 found a bad block check character in the response message.	See error code 027A.
027D	637	INVALID TYPE The 2572 detected an invalid TYPE character in the message sent from the remote device.	See error code 027A.
027E	638	INVALID DATA CHARACTER The 2572 detected an invalid data character in the message sent from the remote device. Only characters 0-9 and A-F are allowed.	See error code 027A.
027F	639	ODD NUMBER OF CHARACTERS The 2572 detected an odd number of characters in the message sent from the remote device. All CAMP messages have an even number of characters.	See error code 027A.
0280	640	UNKNOWN ERROR CHARACTER The response contained an unknown error character.	This error is probably caused by an improperly programmed server node. If the server is a PLC emulating a 2572 server, review the code and correct as required. If the server is another 2572, contact CTI.
0283	643	INVALID ADDRESS The command contained a memory address of 0.	The minimum CAMP address is 1. Enter the correct value for the memory address.
0284	644	INCOMPLETE WRITE The actual number of words written does not match the requested number of words. The actual number of words written is contained in the response message from the remote device.	This error is probably caused by an improperly programmed server node. If the server is a PLC emulating a 2572 server, review the code and correct as required. If the server is another 2572, contact CTI
0290	656	INVALID ADDRESS CLASS The address class is not supported by the server	See error 0284 above.

HEX	DEC	DESCRIPTION	SOLUTION
0292	658	<p>MESSAGE ID MISMATCH</p> <p>The response message contained an ID field which did not match the ID field in the command.</p>	<p>This error could be caused by a timeout value which is too short followed by an attempt to re-send. Therefore, by the time the response to the first command arrives, you have already sent a second command. You may correct this condition by increasing the timeout value.</p> <p>This may also be caused by an improperly programmed server. If the server is a PLC emulating a 2572 server, review the code and correct as required.</p>
029A	666	<p>ERROR WRITING SERIAL PORT</p> <p>The protocol manager encountered an error while writing to a serial port.</p>	<p>Retry the command. If the error persists, this condition may indicate a module hardware problem. Contact CTI.</p>
029D	669	<p>CMD TIMEOUT ERROR</p> <p>The time to process the requested command exceeded the Command Timeout value. Command processing has been halted.</p> <p>Note that the timeout value may have been explicitly set in the Command Block or the default may have been used (timeout = 0).</p>	<p>If you are using UDP, your <i>first</i> attempt to send a message to a newly referenced node may time out while the 2572 is performing address resolution. Retry the command.</p> <p>In some circumstances, you may occasionally get a timeout error, especially with heavy network traffic or remote modem data links. In these circumstances, your logic should retry the command.</p> <p>This error may indicate a bad connection (faulty cable, loose connector, etc.). Check all cabling carefully.</p> <p>If the error persists and you have explicitly set the timeout value, it is possible that you have set the timeout value too small. Try increasing the value or using the default value.</p>
029E	670	<p>ALREADY BUSY ERROR</p> <p>The protocol manager received a new command prior to the completing the previous command.</p>	<p>This error can also be produced by simultaneously triggering two command slots which reference the same command block.</p> <p>If more than one command slot is used, make sure that they reference different command blocks and that the command blocks that they reference have different connection numbers.</p>

HEX	DEC	DESCRIPTION	SOLUTION
02AC	684	<p>MEMORY READ ERROR</p> <p>The 2572 was unable to read the requested V memory.</p> <p>If this occurs on a WRITE REMOTE command block, it indicates that the 2572 could not obtain the data from the local PLC V memory.</p> <p>If this occurs on a READ REMOTE command block, it indicates that the memory in the remote device could not be read.</p>	<p>When this error occurs, it is usually due to an invalid memory address specification in the command block. Check the value for Source in Offset 3 and make corrections if necessary.</p> <p>When this error is returned in response to a READ REMOTE command block, it is also possible that there is a problem in the remote PLC which prevents the 2572 from reading V memory. Retry the command. If the problem persists, check the remote device.</p>
02AD	685	<p>MEMORY WRITE ERROR</p> <p>The 2572 was unable to write the requested memory.</p> <p>If this occurs on a WRITE REMOTE command block, it indicates that the remote device could not write the data into remote memory.</p> <p>If this occurs on a READ REMOTE command block, it indicates that the local PLC could not write the result from the remote device into local V memory</p>	<p>When this error occurs, it is usually due to an invalid memory address specification in the command block. Check the value for Destination in Offset 5 and make corrections if necessary.</p> <p>When this error is returned in response to a WRITE REMOTE command block, it is possible that there is a problem in the remote PLC which prevents the 2572 from writing V memory. Retry the command, if the problem persists, check the remote device</p>

PLC Server Error Codes

The following error codes may be returned by the PLC server or by a CAMP server operating on a serial port. The codes will be displayed only if the server was started by PLC logic.

Some error codes are described as “information only”. They will be displayed only if you start the Network Server using the Start Network Server command. “Information Only” errors are not caused by PLC logic; they are the result of a problem with the client device. Therefore, the PLC Err bit will **not** be set. The server will also return an error code to the client, who must handle error recovery.

HEX	DEC	DESCRIPTION	SOLUTION
236E	9070	NITP PROTOCOL ERROR The 2572 received an invalid NITP message. NITP protocol errors include: <ul style="list-style-type: none">- Odd number of characters received,- Invalid characters received,- Checksum error,- Incorrect character count field.	This error is for information only. No action is required at the 2572/PLC. The 2572 will send an error message to the remote device. The remote device is responsible for error recovery. This error may occur due to communications error (line noise, etc.) on serial lines. It may also result from an improperly programmed remote device. If the error persists, check out the remote device.
2370	9072	INVALID OPTION BIT The option bit setting is invalid when compared to the other parameters in the command block.	Correct the option bit setting or change the conflicting parameters.
2379	9081	INVALID SUBNET MASK The subnet mask that you entered was invalid for the IP address you have assigned to the module. See appendix D.	Correct the subnet mask entry.
237A	9082	INVALID DEVICE CODE The 2572 received a CAMP message with an invalid device code.	This error is for information only. No action is required at the 2572/PLC. The 2572 will send an error message to the remote device, which is responsible for error recovery and corrective action.
237B	9083	INVALID DELIMITER - CAMP PROTOCOL The 2572 received a CAMP message with an invalid message delimiter.	This error is for information only. See error 237A above.

237C	9084	BAD BCC - CAMP PROTOCOL The 2572 received a CAMP message with bad Block Check Character field.	This error is for information only. See error 237A above
237D	9085	INVALID TYPE CODE -CAMP PROTOCOL The 2572 received a CAMP message which contained an invalid Type Code.	This error is for information only. See error 237A above
237E	9086	INVALID CHARACTER - CAMP PROTOCOL The 2572 received a CAMP message which contained an invalid character.	This error is for information only. See error 237A above.
237F	9087	ODD CHARACTER COUNT - CAMP The 2572 received a CAMP message which did not contain an even number of characters.	This error is for information only. See error 237A above.
2380	9088	INVALID ERROR CHARACTER - CAMP The 2572 received a CAMP message which contained an unsupported error character.	This error is for information only. See error 237A above.
2381	9089	NO DATA - CAMP PROTOCOL The 2572 received a CAMP write message which contained no data.	This error is for information only. See error 237A above.
2382	9090	WORD COUNT ERROR - CAMP The 2572 received a CAMP message in which the number of words did not match the word count field.	This error is for information only. See error 237A above.
2383	9091	INVALID MEMORY ADDRESS - CAMP The 2572 received a CAMP message which specified a memory address not supported by the PLC.	This error is for information only. See error 237A above.
2386	9094	INVALID IP ADDRESS The Start Network Server command block does not contain a valid local IP address.	You cannot use a value of 0000 hex or greater than DFFF hex for the IP address. Correct the entry and retry the command.
2387	9095	INVALID PORT NUMBER The Start Network Server command block contains a value of 0 for the PLC server TCP/UDP port number.	You must select a number greater than 0.
2388	9096	INVALID DEFAULT ROUTER ADDRESS The Start Network Server command block contains an invalid address for the default router.	Correct the entry and retry the command. Note: If you do not have a router on the network, set this value to 0.

HEX	DEC	DESCRIPTION	SOLUTION
238D	9101	# OF CONNECTIONS OUT OF RANGE The number of concurrent TCP server connections you specified in Offset 11 of the command block exceeded the maximum allowable value.	Correct the command block and re-execute the command.
238F	9103	INVALID WORD COUNT - CAMP READ The 2572 received a CAMP Read message which contained an invalid word count.	This error is for information only. No action is required at the 2572/PLC. The 2572 will send an error message to the remote device, which is responsible for error recovery and corrective action.
2390	9104	INVALID ADDRESS CLASS - CAMP The 2572 received a CAMP message which contained an unsupported address class	This error is for information only. See error 2390 above.
2391	9105	REQUEST TOO LARGE -CAMP The 2572 received a CAMP message which requested more data than the CAMP protocol can transport in one message.	This error is for information only. See error 2390 above.
2397	9111	UNKNOWN COMMAND The protocol manager received a command number which is not valid.	Ensure that Offset 1 in the Command block contains a valid Command Code. Check that the Command Slot points to the correct V memory Address for the Command Block. Make sure that you have started the correct protocol manager and that you are using the correct connection number.
2398	9112	COULD NOT OPEN PORT The protocol manager could not open the 2572 serial port.	This error applies if you are starting up a copy of the server on the serial port using a Create Connection command. This usually is the result of a hardware error, which may be transient. Retry the command. If the error persists, reset the module. If the error re-occurs after reset, replace the module.
2399	9113	ERROR READING PORT The module detected an error during a read on a 2572 serial port.	See the previous solution.
239A	9114	ERROR WRITING PORT The module detected an error during a write on a 2572 serial port.	See the previous solution.

HEX	DEC	DESCRIPTION	SOLUTION
239B	9115	NETWORK READ ERROR The module detected an error when reading for the Ethernet port	This may be caused by an intermittent network condition. Retry the operation. If the condition persists try replacing the module to determine if the condition will disappear. If replacing the module does not improve the condition, you should test your network thoroughly.
239C	9116	NETWORK WRITE ERROR The module was unable to write data to the TCP/IP socket.	The usual cause of this problem is a lost connection due to network problems or a failure in the remote node. Recovery is the responsibility of the remote node.
239D	9117	COMMAND TIMEOUT The protocol manager timed out before completing the command.	Retry the command. If the timeout error persists, try increasing the value for command timeout. If the timeout error continues to occur, the remote device may not be available or there may not be a network connection to the remote device. Correct the condition and retry.
239E	9118	PROTOCOL MANAGER BUSY The protocol manager received a new command prior to completing the previous command.	You can cause this error by using two command slots to send concurrent commands to the same connection number. Don't do this.
239F	9119	INVALID CONNECTION NUMBER The command block contained an invalid connection number.	Change the connection number in the command block to a valid number. See the documentation on the specific command block.
23A0	9120	BAUD RATE SELECTION ERROR (Serial Ports Only) The protocol manager was passed an invalid baud rate. Valid baud rates are 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600, and 19200.	The error is caused by an incorrect value in the command block for the Create Connection command. Check the value and correct any entry errors. Ensure that the Command Slot points to the correct command block.
23A1	9121	DATA BITS SELECTION ERROR (Serial Ports Only) The protocol manager was passed an invalid value for data bits. Valid data bit values are 5, 6, 7, and 8.	See error code 23A0
23A2	9122	PARITY SELECTION ERROR (Serial Ports Only) The protocol manager was passed an invalid parity value. Valid parity values are 0-None, 1-Odd, 2-Even.	See error code 23A0

HEX	DEC	DESCRIPTION	SOLUTION
23A3	9123	SBIT SELECTION ERROR (Serial Ports Only) The protocol manager was passed an invalid number of stop bits. Valid stop bit values are 1 and 2.	See error code 23A0
23A4	9124	HSHAKE SELECTION ERROR (Serial Ports Only) The protocol manager was passed an invalid handshake value. Valid handshake values are 0- None, 1-Software, 2-Hardware	See error code 23A0
23AB	9131	SERVER ALREADY STARTED The PLC logic attempted to start another copy of the server on the same physical port. If the error occurs while processing the Start Network Server Command, the Network Server was already started. Only one copy of the server is required to service multiple clients.	This is caused by a PLC logic error. It usually occurs when you are triggering the command more than once. It also may occur when you AutoStart the network server and also try to start the network server from PLC logic.
23AC	9132	V MEMORY READ ERROR The 2572 PLC server was unable to read the requested V memory block.	This error code is for information only. The remote device is requesting the 2572 to read a V memory location that is out of the V memory address boundary. Correct the problem at the remote device or re-configure the PLC to expand V memory boundaries.
23AD	9133	V MEMORY WRITE ERROR The 2572 PLC server was unable to write the requested V memory block.	This error code is for information only. The remote device is requesting the 2572 to write a V memory location that is out of the V memory address boundary. Correct the problem at the remote device or re-configure the PLC to expand V memory boundaries.

PLC Client Error Codes

HEX	DEC	DESCRIPTION	SOLUTION
2401	9217	PROTOCOL NOT SUPPORTED The remote device does not support the TCP/IP protocol you are requesting.	The protocol may have been disabled in the startup options of the remote 2572 Network Server. Check the remote device. Check the network address in the command block. If you are using a PC to emulate a PLC server, ensure that the network parameters are properly set.
2402	9218	SOCKET TYPE NOT SUPPORTED The remote device does not support the socket type you are requesting.	See the previous solution.
2403	9219	NETWORK ADDRESS IN USE The 2572 cannot obtain the network address.	This may occur when there is a general problem on the network. Check the network address you have specified in the command block. Correct if necessary. Retry the operation. If the problem persists contact your network administrator.
2404	9220	CANNOT ASSIGN ADDRESS The 2572 cannot assign the requested address.	See above. If the problem persists contact CTI.
2405	9221	NETWORK IS DOWN The network you are attempting to use is down.	This may occur when you are attempting to connect to a remote on another network via a router and the network has been taken out of service. First, make sure that you have specified the correct IP address. Retry the operation. If the problem persists, contact your network administrator.
2406	9222	NETWORK IS UNREACHABLE The network you are attempting to use is unreachable.	You have specified a network address for a network that cannot be found. This probably occurred because you specified an incorrect IP network address. Check the entry in the command block and retry. If you believe that you are using the correct network address, contact your network administrator.
2407	9223	NETWORK CONNECTION ABORTED The remote device (host) aborted the connection.	This may occur if the remote host encountered a problem with TCP data transmission where recovery was not possible. You should attempt to create the connection again. If the problem persists, check the remote host.
2408	9224	CONNECTION RESET BY PEER The remote device has reset the connection.	See error code 2407.

HEX	DEC	DESCRIPTION	SOLUTION
2409	9225	INSUFFICIENT BUFFER SPACE There is insufficient buffer space to hold the message.	This could occur when the remote host has sent more data than the negotiated buffer space. Retry the operation. If the problem persists, contact CTI.
240A	9226	SOCKET NOT CONNECTED The socket you are attempting to use is not connected to the remote host.	The socket may have been previously disconnected from the remote host work by a network error or because the remote host closed the connection. Create the network connection again and retry.
240B	9227	ATTEMPT TO SEND AFTER SOCKET HAS BEEN SHUT DOWN You are attempting to send data to a socket that has been closed	See above.
240C	9228	CONNECTION TIMED OUT The remote host is not responding to an attempt to connect.	Attempt to create the network connection again. If the problem persists check the status of the remote host. Make sure that all IP addresses are properly set, that the remote host is on line, and that network cables are connected properly.
240D	9229	CONNECTION REFUSED The remote host refused the connection.	If the remote host is a 2572, the maximum number of TCP connections allowed has been exceeded. Wait and try again.
240E	9230	REMOTE HOST IS UNREACHABLE The remote host cannot be found.	This error may occur when the remote host has been taken out of service. It may also occur if you have specified an incorrect IP address.
240F	9231	URGENT DATA RECEIVED The remote host has sent urgent data via TCP. This feature is not supported by the 2572.	The remote device has sent you a message format that is not supported. If the remote host is a computer, check to software and network setup. For additional information, see documentation on TCP/IP.
2410	9232	OUT OF BAND DATA RECEIVED You have been sent out of band data via TCP. This feature is not supported by the 2572.	See above.
246E	9326	NITP PROTOCOL ERROR When the 2572 sent an NITP message, the remote device replied with an invalid NITP message. NITP protocol errors include: - Odd number of characters received, - Invalid characters received, - Checksum error, - Incorrect character count field.	This error may occur due to communications error (line noise, etc.) on serial lines. It may also result from an improperly programmed remote device. Retry the operation. If the error persists, check out the remote device.

HEX	DEC	DESCRIPTION	SOLUTION
2470	9328	INVALID OPTION BIT The option bit setting is invalid when compared to the other parameters in the command block.	Correct the option bit setting or change the conflicting parameters. If you are using TCP, you cannot set the IP Address Location bit to 1.
2473	9331	BAD OR MISSING DELIMITER The <i>receiving</i> device detected a bad or missing delimiter in the command message	This error usually indicates a transient error in the data link. You should retry the command. If the receiving node is a computer simulating a 2572 PLC server, ensure that the software is correctly processing the message. If the error persists contact CTI.
2474	9332	BAD BLOCK CHECK CHARACTER The <i>receiving</i> device detected a block check character error in the command message.	See error code 2473
2475	9333	INVALID TYPE The <i>receiving</i> device reported an invalid TYPE character in the message.	See error code 2473.
2476	9334	INVALID DATA CHARACTER The <i>receiving</i> device reported an invalid data character. Only characters 0-9 and A-F are allowed.	See error code 2473.
2477	9335	ODD NUMBER OF CHARACTERS The <i>receiving</i> device reported an odd number of characters in the message. All CAMP messages have an even number of characters.	See error code 2473.
2478	9336	INVALID DEVICE CODE The <i>receiving</i> device reported an invalid device code in the message.	See error code 2473.
247A	9338	INVALID DEVICE CODE The 2572 detected an invalid device code in the response from the remote device	This error may result from a transient error in the data link. You should retry the command. If the problem persists, check the quality of the data link. If the remote node is a computer simulating a 2572 PLC server, ensure that the software is correctly creating the response the response message
247B	9339	BAD OR MISSING DELIMITER The 2572 detected a missing delimiter in the response message	See error code 247A.
247C	9340	BAD BLOCK CHECK CHARACTER The 2572 found a bad block check character in the response message.	See error code 247A.
247D	9341	INVALID TYPE The 2572 detected an invalid TYPE character in the message sent from the remote device.	See error code 247A.

HEX	DEC	DESCRIPTION	SOLUTION
247E	9342	INVALID DATA CHARACTER The 2572 detected an invalid data character in the message sent from the remote device. Only characters 0-9 and A-F are allowed.	See error code 247A.
247F	9343	ODD NUMBER OF CHARACTERS The 2572 detected an odd number of characters in the message sent from the remote device. All CAMP messages have an even number of characters.	See error code 247A.
2480	9344	UNKNOWN ERROR CHARACTER The response contained an unknown error character.	This error is caused by an improperly programmed server node. If the server is a PLC emulating a 2572 server, review the code and correct as required. If the server is another 2572, contact CTI.
248A	9354	INVALID SERVICE TYPE You specified an invalid value for Type of Service. Must be 1=TCP or 2=UDP.	Correct the value in the Command Block.
248B	9355	INVALID REMOTE IP ADDRESS You specified an invalid value for the remote IP Address.	Correct the value in the Command Block.
2490	9360	INVALID ADDRESS CLASS The address class is not supported by the remote device.	If the server is another 2572, check the firmware version of the module to ensure the latest revision. If the server is a PLC emulating a 2572 server, review the code and correct as required.
2492	9362	CAMP ID MISMATCH The response did not contain a message ID which matched the command. This can be caused by an improperly programmed remote device. It can also be caused by response delays which exceed the command timeout value. Thus it may be a response to a previous command.	Check the remote device for problems and correct as required. Determine whether you have response delays that exceed the command timeout. You may be able to increase the timeout value so that the command waits longer for a response. You can use network analyzer software to view network traffic. See the <i>Troubleshooting</i> Chapter of this manual and the <i>CTI 2572 Installation and Operation Guide</i> .
2497	9367	UNKNOWN COMMAND The protocol manager received a command number which is not valid.	Ensure that Offset 1 in the Command block contains a valid Command Code. Check to be sure that the Command Slot points to the correct V memory Address for the Command Block. Make sure that you have specified the correct protocol manager number in the Create Connection command and that you are using the right connection number.

HEX	DEC	DESCRIPTION	SOLUTION
2498	9368	<p>COULD NOT OPEN PORT</p> <p>The protocol manager could not open the 2572 serial port. Occurs during a Create Connection command.</p>	<p>This error may occur when you are starting up a client on the serial port.</p> <p>This usually is the result of a hardware error, which may be transient. Retry the command. If the error persists, reset the module. If the error re-occurs after reset, replace the module.</p>
2499	9369	<p>ERROR READING PORT</p> <p>The protocol manager detected an error during a read on a 2572 serial port.</p>	See error code 2498.
249A	9370	<p>ERROR WRITING PORT</p> <p>The protocol manager detected an error during a write on a 2572 serial port.</p>	See error code 2498.
249D	9373	<p>CMD TIMEOUT ERROR</p> <p>The time to process the requested command exceeded the Command Timeout value. Command processing has been halted.</p> <p>Note that the timeout value may have been explicitly set in the Command Block or the default may have been used (timeout = 0).</p>	<p>In some circumstances, you may occasionally get a timeout error, especially with heavy network traffic or remote modem data links. In these circumstances, your logic should retry the command.</p> <p>This error may indicate a bad connection (faulty cable, loose connector, etc.). Check all cabling carefully.</p> <p>If the error persists and you have explicitly set the timeout value, it is possible that you have set the timeout value too small. Try increasing the value or using the default value.</p>
249E	9374	<p>PROTOCOL MANAGER BUSY</p> <p>The protocol manager received a new command prior to completing the previous command.</p>	You can cause this error by using two command slots to send concurrent commands to the same connection number. Don't do this.
249F	9375	<p>INVALID CLIENT CONNECTION NO.</p> <p>The connection number used during Create Socket was out of the valid range. The valid range of connection numbers is 19221 - 19228.</p>	Correct the command block data.
24A0	9376	<p>BAUD RATE SELECTION ERROR</p> <p>(Serial Ports Only). The protocol manager was passed an invalid baud rate. Valid baud rates are 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600, and 19200.</p>	This error usually results from an incorrect value in the command block for the Create Connection command. Check the value and correct any entry errors. Ensure that the Command Slot points to the correct command block.

HEX	DEC	DESCRIPTION	SOLUTION
24A1	9377	DATA BITS SELECTION ERROR (Serial Ports Only). The protocol manager was passed an invalid value for data bits. Valid data bit values are 5, 6, 7, 8.	See error code 24A0
24A2	9388	PARITY SELECTION ERROR (Serial Ports Only). The protocol manager was passed an invalid parity value. Valid parity values are 0-None, 1-Odd, 2-Even.	See error code 24A0
24A3	9379	STOP BIT SELECTION ERROR (Serial Ports Only). The protocol manager was passed an invalid number of stop bits. Valid stop bit values are 1 and 2.	See error code 24A0
24A4	9380	HANDSHAKE SELECTION ERROR (Serial Ports Only). The protocol manager was passed an invalid handshake value. Valid handshake values are: 0-No Handshake, 1-Software Handshake, 2-Hardware Handshake.	See error code 24A0
24AC	9388	MEMORY READ ERROR The 2572 was unable to read the requested V memory.	When this error occurs, it is usually due to an invalid memory address specification in the command block. Check the command block and make corrections if necessary. Check to ensure that the PLC you are addressing is configured for the address you are trying to access.

E-Mail Error Codes

NOTE:

Some E-mail delivery errors will not be detected at the time the command is executed. When these errors occur, most mail servers generate a reply message back to the initiator of the message. If you wish to be notified of these errors, make sure you have entered the appropriate address in the "REPLY TO" string.

HEX	DEC	Description	Corrective Action
2D01	11521	No SMTP Server Was Available At The Target IP Address.	Ensure that you have entered the correct IP address
2D02	11522	Failed To Open A TCP Connection With The Target IP Address	Ensure that you have entered the correct IP address
2D03	11523	TCP Timeout	Retry Command. If the error persists, check network.
2D04	11524	SMTP Error #421: Service not available, closing transmission channel	See E-mail Server Administrator
2D05	11525	SMTP Error #450: Requested mail action not taken: mailbox unavailable (e.g., mailbox busy)	See E-mail Server Administrator
2D06	11526	SMTP Error #451: Requested action aborted: local error in processing	See E-mail Server Administrator
2D07	11527	SMTP Error #452: Requested action not taken: insufficient system storage	See E-mail Server Administrator
2D08	11528	SMTP Error #500: Syntax error, command unrecognized	See E-mail Server Administrator
2D09	11529	SMTP Error #501: Syntax error in parameters or arguments	See E-mail Server Administrator
2D0A	11530	SMTP Error #502: Command not implemented	See E-mail Server Administrator
2D0B	11531	SMTP Error #503: Bad sequence of commands	See E-mail Server Administrator
2D0C	11532	SMTP Error #504: Command parameter not implemented	See E-mail Server Administrator
2D0D	11533	SMTP Error #550: Requested action not taken: mailbox unavailable.	See E-mail Server Administrator
2D0E	11534	SMTP Error #551: User not local	See E-mail Server Administrator
2D0F	11535	SMTP Error #552: Requested mail action aborted: exceeded storage allocation	See E-mail Server Administrator
2D10	11536	SMTP Error #553: Requested action not taken: mailbox name not allowed (e.g., mailbox syntax incorrect)	See E-mail Server Administrator
2D11	11537	SMTP Error #554: Transaction failed	See E-mail Server Administrator
2D12	11538	Error reading PLC V memory - Recipient List	Ensure that V memory address is valid and that it contains a valid string.
2D13	11540	Error reading PLC V memory - Reply To:	Ensure that V memory address is valid and that it contains a valid string.
2D14	11541	Error reading PLC V memory - Subject	Ensure that V memory address is valid and that it contains a valid string.
2D15	11542	Error reading PLC V memory - Message	Ensure that V memory address is valid and that it contains a valid string.
2D16	11543	Illegal IP address (0.0.0.0 or 255.255.255.255)	Correct the entry and retry
2D17	11544	Illegal GMT offset (greater than +12 or less than -12)	Correct the Entry and retry

HEX	DEC	Description	Corrective Action
2D18	11545	Error starting SMTP protocol manager	Ensure that all command block parameters are valid.
2D20 - 2DFF		System errors	Contact Technical Support

Send Receive Error Codes

HEX	DEC	Description	Possible Corrective Action
2E01	11777	TSAP length too long(>10 bytes)	Ensure the entry is correct
2E02	11778	Out-of-range connection number	Use a number between 19221 and 19228
2E03	11779	Local TSAP specified is already in use	Select another TSAP name
2E04	11780	Remote TSAP specified is already in use for the remote IP address.	Select another TSAP name. You may need to set up another TSAP in the partner PLC.
2E05	11781	Local TSAP Length = 0	Correct the command block entry.
2E06	11782	Local TSAP V memory address = 0	Correct the command block entry.
2E07	11783	Remote TSAP Length = 0	Correct the command block entry.
2E08	11784	Remote TSAP V memory address = 0	Correct the command block entry.
2E09	11785	Local TSAP V memory address exceeds PLC maximum	Correct the command block entry.
2E0A	11786	Remote TSAP V memory address exceeds PLC maximum	Correct the command block entry.
2E0B	11787	Duplicate attempt to create a Passive connection	Check the logic used to trigger the command block. You are probably triggering the command more than once.
2E0C	11788	Reserved	Not Used
2E0D	11790	Attempted to send packet with no data (word count = 0)	Correct the command block entry.
2E0E	11791	V memory address in SEND or RECEIVE command = 0	Correct the command block entry.
2E0F	11792	Number of words to transfer exceeds 512	Correct the command block entry.
2E10	11793	Remote IP address is the same as the local 2572 IP address	Correct the command block entry.
2E20	11808	Connection lost: TCP Keep Alive timeout	Retry the Send or Receive command. The module will automatically attempt to re-establish the connection. If the problem persists, check the network and partner.
2E21	11809	Partner PLC explicitly closed the connection.	Partner PLC must open a new connection before you can continue.
2E22	11810	The specified partner supports ISO on TCP (Port 102) but Open connection request was denied.	This error is probably due to an incorrect TSAP entry.
2E23	11811	Open Active connection failed to open a TCP connection on port 102 at the specified IP address. The PLC address exists but the target does not support ISO on TCP.	Ensure that you have specified the correct IP address. If the target is a 505 PLC using a 2572 module, ensure that the firmware supports the Send/Receive feature. <i>Note: Port 102 availability can be verified by using a Windows Telnet application. Configure telnet to access port 102 rather than the default telnet port, and then attempt to connect to the remote IP. If the message box "connect Failed" does not appear, the port 102 is available on the remote machine.</i>
2E24	11812	A RECEIVE command was issued on a Passive connection that has not yet been established.	Correct the application logic.

HEX	DEC	Description	Possible Corrective Action
2E25	11813	A SEND command was issued on a Passive connection that has not yet been established.	Correct the application logic.
2E26	11814	Remote system attempted to open a connection on a TSAP locally configured as an Active connection.	Correct the application logic.
2E27	11815	Logic attempted to create an active TCP connection when the TCP connection is already established.	Correct the application logic.
2E28	11816	Connection has been lost. Protocol manager is attempting to re-establish the connection.	Continue to retry. If the problem persists, check the network and partner PLC.
2E30	11824	A command is already in process for this connection number.	Correct the application logic.
2E31	11825	Reserved	Not Used in this release
2E32	11826	No data available to Receive command. Occurs when timeout value of 0 is specified and no data is currently available to be read.	Retry the command. If the problem persists check the partner PLC.
2E33	11827	Error writing to local V memory during Receive command	Retry the command. If the problem persists check the PLC I/O configuration and applicable Command Block entries.
2E34	11828	Error reading from V memory during Send command	Retry the command. If the problem persists check the PLC I/O configuration and applicable Command Block entries.
2E35	11829	The partner controller is not accepting additional data. TCP window size has been set to 0 by the partner.	Ensure that the partner controller is running logic (in Run mode). Reduce the rate at which messages are sent to the partner.
2E40	11840	Incoming packet data length is 0.	Check partner PLC configuration.
2E41	11841	Incoming packet data length is longer than the data length specified in the command block.	This is a warning message that you can use in your application logic. You may choose to ignore the error and use the truncated data.
2E64 - 2E96	11876 - 11926	System Errors.	Contact Technical Support.
2E97	11927	Invalid command code.	Correct Command Block Entry.
2E98 - 2EFF	11928 - 12031	System errors	Contact Technical Support.

DataShare Error Codes

When DataShare detects specified error conditions, it will report them to the PLC application in the first word of the applicable Command Block. These errors are reported to the PLC only when a command has been triggered by PLC logic. Errors that occur after successful completion of initiating command has successfully completed are not reported to the PLC by the protocol.

When automatic triggering is selected (PLC scan, timer, etc.), DataShare will indicate an error condition only when the DataShare instance is initiated. During the processing of starting a producer instance, one message will be produced to verify that Ethernet can be accessed. Even when using one of the automatic triggering options, you can use application logic to detect run time problems. For example, the logic could periodically trigger a manual production to test the network. A consumer application could use the embedded sequence number (written to the first V memory

location) to verify that data is being consumed. Note that error counts will be logged in DataShare diagnostic statistics and can be accessed by the user for troubleshooting.

HEX	DEC	Description	Possible Corrective Action
2F00	12032	Connection number out of Range	Correct the Command Block entry.
2F01	12033	The specified connection ID is already in use (Duplicate request).	Correct the Command Block entry.
2F02	12034	V memory address of user data = 0	Correct the Command Block entry.
2F03	12035	Data ID = 0	Correct the Command Block entry.
2F04	12036	Number of user data words to produce or consume = 0	Correct the Command Block entry.
2F05	12037	Number of user data words to produce or consume exceeds 512	Correct the Command Block entry.
2F06	12038	Unable to allocate memory	Retry the command
2F07	12039	Attempted to trigger a data production using a connection number assigned to a consumer	Change the PLC logic or associated Command Block to use the correct connection number. Change the Command Block used to create the DataShare instance to start a producer rather than a consumer.
2F08	12040	Timer Interval or Scan Interval = 0	Correct the Command Block entry.
2F09	12041	Time interval exceeds maximum value (3200 seconds)	Correct the Command Block Entry
2F0B	12043	Invalid Trigger Option	Correct the Command Block entry.
2F0C	12044	Consumer Starting Data word = 0	Correct the Command Block entry.
2F0D	12045	Consumed block specification exceeds the maximum data block size. The specified Data Length added to the Starting Data Word must be less than or equal to 513.	Correct the Command Block entry for Data Length or Starting Data Word.
2F0E	12046	Producer was unable to transmit data. No data was produced after 16 tries. <i>NOTE: For timer or scan trigger options, the error will be reported only when starting the producer.</i>	Retry the command. If the problem persists check the network connections and cabling.
2F0F	12047	No Ethernet carrier was detected when the Producer attempted to send a packet.	Check cable connections. The cable is probably faulty or not connected.
2F10	12048	No Ethernet CTS signal was detected when the Producer attempted to send a packet.	Check cable connections. The cable is probably faulty or not connected.
2F11	12048	Module dipswitch setting has not enabled the DataShare feature	Set the dipswitch to enable DataShare
2F12	12050	Duplicate consumer data ID specified in command block. Another consumer on this module is using this data ID.	Correct the Command Block entry
2F13	12051	Attempt to trigger a producer that has not been started. Connection Number is not in use.	Ensure you have entered the correct Connection Number Start the producer instance.
2F97	12183	Invalid Command	Correct the Command Block entry

HEX	DEC	Description	Possible Corrective Action
2FAC	12204	V memory address of user data extends beyond PLC maximum	Correct Command Block Entry
2FC8- 2FFF	12238 - 12287	System errors.	Contact Technical Support

2572 Internal Errors

Error codes whose lower byte is greater than C8 hex are internal code errors. If you should experience one of these errors, contact CTI for assistance.

APPENDIX C. REFERENCE MATERIAL

Hexadecimal to ASCII Conversion Table

00	NUL	20	space	40	@	60	'
01	SOH	21	!	41	A	61	a
02	STX	22	"	42	B	62	b
03	ETX	23	#	43	C	63	c
04	EOT	24	\$	44	D	64	d
05	ENQ	25	%	45	E	65	e
06	ACK	26	&	46	F	66	f
07	BEL	27	'	47	G	67	g
08	BS	28	(	48	H	68	h
09	HT	29	)	49	I	69	i
0A	LF	2A	*	4A	J	6A	j
0B	VT	2B	+	4B	K	6B	k
0C	FF	2C	,	4C	L	6C	l
0D	CR	2D	-	4D	M	6D	m
0E	SO	2E	.	4E	N	6E	n
0F	SI	2F	/	4F	O	6F	o
10	DLE	30	0	50	P	70	p
11	DC1	31	1	51	Q	71	q
12	DC2	32	2	52	R	72	r
13	DC3	33	3	53	S	73	s
14	DC4	34	4	54	T	74	t
15	NAK	35	5	55	U	75	u
16	SYN	36	6	56	V	76	v
17	ETB	37	7	57	W	77	w
18	CAN	38	8	58	X	78	x
19	EM	39	9	59	Y	79	y
1A	SUB	3A	:	5A	Z	7A	z
1B	ESC	3B	;	5B	[	7B	{
1C	FS	3C	<	5C	\	7C	|
1D	GS	3D	=	5D	]	7D	}
1E	RS	3E	>	5E	^	7E	~
1F	US	3F	?	5F	_	7F	DEL

Monitoring the AUI/10BaseT Bit.

Bit 6 of the module WX1 word can be used to monitor whether the AUI port or the 10BaseT port is being used. In applications using redundant cabling (one cable connected via a transceiver to an AUI port and one cable directly to the 10BaseT port), the bit can be used to detect when the primary cable has failed and the signal on the backup cable is being used. When a Link Beat signal is detected on the 10BaseT port, indicating that the cable is connected properly, the module will automatically select the 10BaseT port and set bit 6 off. Otherwise bit 6 will be set on. See the *WX/WY Quick Reference* in this appendix.

Writing Network Parameters to EEPROM (PLC Method)

You can use PLC logic to write the network parameters to the 2572 EEPROM. The following Command Block structure is used for this function. The command is triggered using the command control bits in module WY4.

The write command is useful when you want to use a PLC (rather than a serially attached PC) to write the network data to the module EEPROM. Once the EEPROM contains valid data and the module is set to AUTOSTART, the 2572 will obtain its network data from the EEPROM.

Offset	Description	Hex Value	Decimal Value
0	Command Error Word	0000	0
1	Command (Write EEPROM)	000C	12
2	Connection Number	4B00	19200
3	TCP Stale Socket Timeout (in seconds)	0000	0
4	IP Address of this PLC module (High 16 bits)		
5	IP Address of this PLC module (Low 16 bits)		
6	TCP / UDP Port Number	05E1	1505
7	IP Address of Default Router (High16 bits)		
8	IP Address of Default Router (Low 16 bits)		
9	Subnet Mask (High 16 bits)		
10	Subnet Mask (Low 16 bits)		
11 -15	Unused - Reserved for Future Use (Set to 0)	0000	0

NOTE:

If the module EEPROM Write Protect switch is ON, this command will return an error.

<i>Offset 0</i>	<i>Error Word</i> - Set to 0 so that any previous error code is cleared.
<i>Offset 1</i>	<i>Command Code</i> - The Command for Start Network Server is 4.
<i>Offset 2</i>	<i>Connection Number</i> - Set this to 19200 (hex 4B00).
<i>Offset 3</i>	<i>TCP Stale Socket Timeout</i> - This value specifies the amount of elapsed time (in seconds) without any messages from the client application before the 2572 will automatically close a server TCP socket. If the value is set to 0, then the 2572 will not automatically close the socket unless the client application explicitly closes the connection or a network error is detected.
<i>Offset 4-5</i>	<i>IP Address</i> Offset 4 - This should contain the high 16 bits of the module IP address. Offset 5 should contain the low 16 bits of the IP address. An IP Address of 0.0.0.0 (0000 0000 hex) or greater than 223.255.255.255 (DFFF FFFF hex) will return an error.
<i>Offset 6</i>	<i>TCP/UDP Port</i> - This will be the port ID used to connect to the 2572 PLC Server application. CTI documentation examples assume that this will be set to 1505 decimal. You should use this value unless you have a reason to do otherwise. Note that port numbers 1023 and below are reserved by the IANA (Internet Assigned Numbers Authority) for "well known" ports. Other values may have been reserved by your network administrator. Port 7 is automatically assigned as an echo server in compliance with RFC 1340.
<i>Offset 7-8</i>	<i>IP Address of Default Router</i> - This identifies the address of the router to which unknown IP addresses will be directed. Offset 8 contains the high 16 bits of the address and Offset 9 contains the low 16 bits. An IP address greater than 223.255.255.255 (DFFF FFFF hex) will return an error. If you do not have a router on your network, set this to 0000 0000.
<i>Offset 9-10</i>	<i>Subnet Mask</i> - Specifies the subnet mask assigned to this network. Offset 9 contains the high 16 bits of the mask and Offset 10 contains the low 16 bits. If offset 9 and 10 contain a value of 0, then the subnet mask will default to the standard for the IP address class. A subnet mask must contain all 1's in the network portion of the IP address and must allow at least 2 bits of host address. In addition, the subnet mask cannot be set so that the derived host address is 0 or a broadcast address (all ones).

Reading Network Parameters from EEPROM (PLC Method)

The Read EEPROM command allows you to obtain the network parameters stored in the module EEPROM. The command is triggered using the command control bits in the module WY4 word.

Offset	Description	Hex Value	Decimal Value
0	Command Error Word	0000	0
1	Command (Read EEPROM Network Data)	000D	13
2	Connection Number	4B00	19200
3	Destination for Answer Starting V memory Location		
4	Number of Words to Reserve (Minimum=9)	000B	11
5- 15	Unused - reserved for future use (Set to 0)	0000	0

Offset 0 *Error Word* - Set to 0 so that any previous error code is cleared.

Offset 1 *Command Code* - The Command for Reading EEPROM Network Data is 13 decimal (hex 000D).

Offset 2 *Connection Number* - Set this to 19200 decimal (hex 4B00). This connection number communicates with the module.

Offset 3 *Destination for Answer* - The result of the read operation will be stored in contiguous V memory locations starting at the location in offset 3.

Offset 4 *Number of Words to Reserve* - This version returns 11 words of data. Previous versions returned 9. Future versions could return more. By specifying the number of words to 9 you can limit the data returned to be compatible with previous versions.

The following data is returned by this command

Offset	Description
0	Module Ethernet ID (High 16 bits)
1	Module Ethernet ID (Middle 16 bits)
2	Module Ethernet ID (Low 16 bits)
3	TCP Stale Socket Timeout
4	Module IP Address (High 16 bits)
5	Module IP Address (Low 16 bits)
6	TCP/UDP Port Number (2572 PLC Server)
7	Default Router (High 16 bits)
8	Default Router (Low 16 bits)
9	Subnet Mask (High 16 bits)
10	Subnet Mask (Low 16 bits)

APPENDIX D. PLC COMMAND INTERFACE

General Description

CTI 2572 modules log into the PLC as 2 WX inputs and 6 WY outputs. The PLC controls the module by placing values in specific WY words. The PLC obtains status information from the module via the WX words. Areas of V memory called *Command Blocks* are used to store command information.

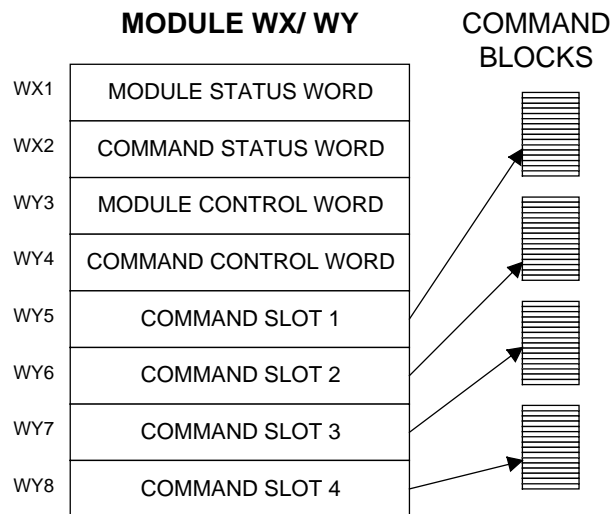


Figure 21. PLC Command Interface

Figure 21 illustrates the 2572 PLC Command Interface. The control structures consist of the module WX/WY words and the Command Blocks. Words WY5-WY8 contain the V memory addresses of the command blocks. Using this command interface, the PLC can initiate up to four commands at one time. The status and control bits for the four commands are located in WX2 and WY4, respectively.

Command Processing Modes

You can specify how the module command execution is synchronized with the PLC logic by setting the Command Mode bit in WY4. The Command Mode bit is described in detail later in this appendix. You can select either *coupled* mode or *uncoupled* mode.

Coupled Mode Processing

Coupled Mode provides for tight "handshaking" between the module and the PLC. When the PLC triggers the command, the module will execute the command *only once*. The module will then wait for acknowledgment from the PLC before allowing the command to be triggered again. Coupled mode is useful for initiating transfers that must be done exactly one time per PLC event (such as Starting the Network Server).

Uncoupled Mode Processing

Uncoupled Mode does not require a handshaking sequence from the PLC. When Uncoupled Mode is selected, the module will execute the command continuously as long as the command trigger is set. Uncoupled mode is useful for providing continuous updates of PLC data.

Command Processing Procedure

Following is the typical procedure used to initiate a module command:

- Set up the Command Block(s) in V memory using your PLC programming software
- Load the command slot(s) with the address of the Command Block(s).
- Set the applicable command trigger and mode bits in WY4.
- Monitor the status of the command processing using WX2.

WX/WY Description

Figure 22 shows the layout of the WX and WY words assigned to the module. WX1 and WY3 are used for global module control and status. The remaining words are used for command processing. Note there are four command slots, which allows the PLC to trigger up to four module commands in one scan. The four sets of bits in WX2 and WY4 correspond to the four command slots.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Module Status Word																WX1
Command Status Word																WX2
CMD 1 Status Bits				CMD 2 Status Bits				CMD 3 Status Bits				CMD 4 Status Bits				
Module Control Word																WY3
Command Control Word																WY4
CMD 1 Control Bits				CMD 2 Control Bits				CMD 3 Control Bits				CMD 4 Control Bits				
Command Slot 1: V Memory Address of Command Block for CMD1																WY5
Command Slot 2: V Memory Address of Command Block for CMD2																WY6
Command Slot 3: V Memory Address of Command Block for CMD3																WY7
Command Slot 4: V Memory Address of Command Block for CMD4																WY8

Figure 22. WX/WY Map

Module Status Word

The module Status Word is located in the module WY1. This word is used to communicate the overall status of the module. The module uses the following bit structure:

1	2	3	4	5	6	7	8	9 - 15
MOD FAIL	SER CFG	NET CFG	DIAG ERR	CFG ERR	AUI ACT	DS ACT	RSVD	Timer E Code

MOD FAIL - Severe Module Failure

If the diagnostics discovers a severe fault, the module sets the MOD FAIL bit and (usually) one of the of the error bits to indicate the problem source. After a delay of about 1 second, the module will perform an internal reset and attempt to perform normal processing. If the fault recurs, the wait and reset cycle will be repeated indefinitely. If the fault is cleared, the module will resume normal operations.

SER CFG - Serial Configuration Required

This bit will remain set until *all* serial ports have been configured. When all ports have been configured, this bit will be cleared.

NET CFG - Network Configuration Required

This bit will remain set until the network parameters have been loaded. These may be loaded via PLC logic or automatically loaded from module EEPROM. Once the network parameters have been successfully loaded, this bit will be cleared.

DIAG ERR - Diagnostic Detected Error

If the module diagnostics detect a faulty RAM or ROM, the DIAG ERR bit will be set. When this type of error occurs, the problem is severe. The module will also set the module fail bit and perform a reset after a short delay.

CFG ERR - Configuration Error

This bit will be set if the module detects invalid hardware switch settings or invalid EEPROM data at startup / reset time.

AUI ACT - AUI Active

This bit is set when the AUI port is selected. The 2572 will automatically select the AUI port when there is no link beat signal on the 10bT port. If you are using 10baseT (UTP) cables, PLC logic might use this bit to detect a break or disconnection of the cable.

DS ACT – DataShare Active

This is used with the DataShare Protocol (see CHAPTER 6. DATASHARE PROTOCOL)

RSVD - Reserved

This bit position is reserved for future use.

TIMER/ ECODE - Timer or Error Code

When the module processor is operating and there are no significant errors, the lower 8 bits of WX1 will display the value of a module timer. If a hardware error occurs, an error code will be written to this field, if possible.

NOTE:

The changing timer bits are an indication that the module processor is operating.

Module Control Word

Module Control Word (WY3)															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mod Rst						DS En									

Module Control Bits are contained in WY3. Bit 1 is a module reset bit. **When the bit is set and all four abort triggers are set, the module will perform a hardware reset.** This operation resets the processor and starts all hardware diagnostics and startup functions. It is available for extreme error cases where simply acknowledging an error or aborting a command does not clear the error.

NOTE:

Once the module has reset, your PLC logic must re-execute any commands used to configure the module or to start the network server.

Bit 7 (DS EN) is used with the DataShare Protocol. Bits other than bit 1 and 7 are reserved for future use and should be set to 0.

Command Control and Command Status Words

The command status word and the command control word contains bits that are used to synchronize and control the execution of module commands. The Command Control Word is located in module word WY4 and contains bits that are set by the PLC logic. The Command Status Word is located in WX2 and contains bits that are set by the module.

Since the PLC can send up to four commands to the module per scan, both the Command Control Word and the Command Status Word contain four sets of bits, one set for each possible concurrent command. For example, the first four bits (bits 1-4) in both words relate to command Slot 1, the next four bits (bits 5-8) relate to command Slot 2, etc.

The four command slots execute commands independently. Thus, an error on one command does not affect processing on the other commands than happen to be executing at the same time. The command slots can be triggered at different times or some (or all) may be triggered concurrently.

Command Control Word

The Command Control Word contains bits that are set by the PLC logic. The following illustration indicates how the bits within the word are used.

COMMAND CONTROL WORD (WY4)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ERR Ack	CMD Mode	CMD Trig	Abort Trig	ERR Ack	CMD Mode	CMD Trig	Abort Trig	ERR Ack	CMD Mode	CMD Trig	Abort Trig	ERR Ack	CMD Mode	CMD Trig	Abort Trig
COMMAND 1				COMMAND 2				COMMAND 3				COMMAND 4			

ERROR Ack *Error Acknowledge.* The PLC sets this bit to acknowledge the error bit which was set by the 2572.

CMD Mode *Command Mode.* The PLC sets this bit to control how the module command execution is synchronized with the PLC logic:

0 = Uncoupled mode - The 2572 command processing is not synchronized with the PLC logic.

1 = Coupled mode - The 2572 command processing is synchronized with the PLC logic.

CMD Trig *Command Trigger.* The PLC sets this bit to initiate a command.

ABORT Trig *Abort Trigger.* The PLC sets this bit to abort a command in progress.

Command Status Word

The Command Status Word contains bits that are set by the module. The following illustration indicates how the bits within the word are used.

COMMAND STATUS WORD (WX2)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CMD Err	PLC Err	CMD Busy	Abt Busy	CMD Err	PLC Err	CMD Busy	Abt Busy	CMD Err	PLC Err	CMD Busy	Abt Busy	CMD Err	PLC Err	CMD Busy	Abt Busy
COMMAND 1				COMMAND 2				COMMAND 3				COMMAND 4			

CMD Err	<i>Command Error.</i> The 2572 sets this bit when it encounters an error while attempting to execute the command. The 2572 will write an error code into Offset 0 of the command block unless PLC ERR is also set (see below).
PLC Err	<i>PLC Read/Write Error.</i> The 2572 sets this bit to indicate that it could not read a valid command block from V memory. Therefore, there is no place to write an error word. This may be caused by loading a value in the Command Slot which is not a valid V memory location (such as 0) or which points to V memory that does not contain a Command Block.
CMD Busy	Indicates the module is in the process of executing a command.
ABORT Busy	Indicates the module is attempting to abort a command.

Command Slots (WY5-WY8)

Module words WY5, WY6, WY7, and WY8 are called Command Slots. There are four command slots, one for each possible concurrent command. The value in the command slot points to the V memory address of a command block as illustrated below. Addresses of 0 or less are invalid. Addresses greater than 64k cannot be referenced.

COMMAND SLOTS

WY5	Command Slot 1: V Memory Address of Command Block for CMD1
WY6	Command Slot 2: V Memory Address of Command Block for CMD2
WY7	Command Slot 3: V Memory Address of Command Block for CMD3
WY8	Command Slot 4: V Memory Address of Command Block for CMD4

Note that the command slots match up with the command control and command status bits in WY4 and WX2. For example, the command block whose address in Command Slot 1 will be triggered by setting bit 3 in WY4 (Bit 3 is the Command Trigger for Command 1).

WX2 and WY4 Relationships

The following illustrates the relationship between the first four bits in WX2 and WY4. This relationship applies to the other three sets of bits.

Word	Bit 1	Bit 2	Bit 3	Bit 4
WX2	CMD Err	PLC Err	CMD Busy	Abort Busy
WY4	ERR Ack	CMD Mode	CMD Trigger	Abort Trigger

Error Processing Bits

The module will set CMD ERR any time an error occurs in processing a command. The module will also set PLC ERR if a valid Command Block cannot be read from V memory. After setting the error bits, the module will halt processing on this command. The PLC acknowledges the error by setting ERR ACK. When the module sees ERR ACK go high, it aborts the command, clears the error bits, and is ready to accept another command trigger for this slot.

Command Processing bits

The PLC sets the CMD MODE bit to select whether Coupled Mode or Uncoupled Mode is used. The PLC sets the CMD TRIGGER to initiate the command. When the module begins command processing, it sets the CMD BUSY bit. The CMD BUSY bit will remain on until the module has completed processing the command.

Abort Processing Bits

The PLC can set the ABORT TRIGGER to request the module to abort a command that is in process. When the module starts the process of aborting a command, it raises the ABORT BUSY bit. When the process is complete, it lowers ABORT BUSY (and also CMD BUSY).

The timing diagrams in this appendix describe the interaction of the various Command Control and Command Status bits.

Command Blocks

Command Blocks contain information which specifies how the command is to be executed. The standard Command Block consists of 16 contiguous words located in the first 64k of PLC V memory and has the following general structure.

Offset	Contents
0	Error Word
1	Command Code
2	Connection Number
3	Command Parameter 1
4 - 15	Additional parameters

Error Word Assuming the Command Block is valid, the module will write an error code into this location when it encounters an error in executing the command. The error code can be used during development as an aid to de-bugging logic. It may also be used by the PLC logic as an indication to execute specific error processing logic.

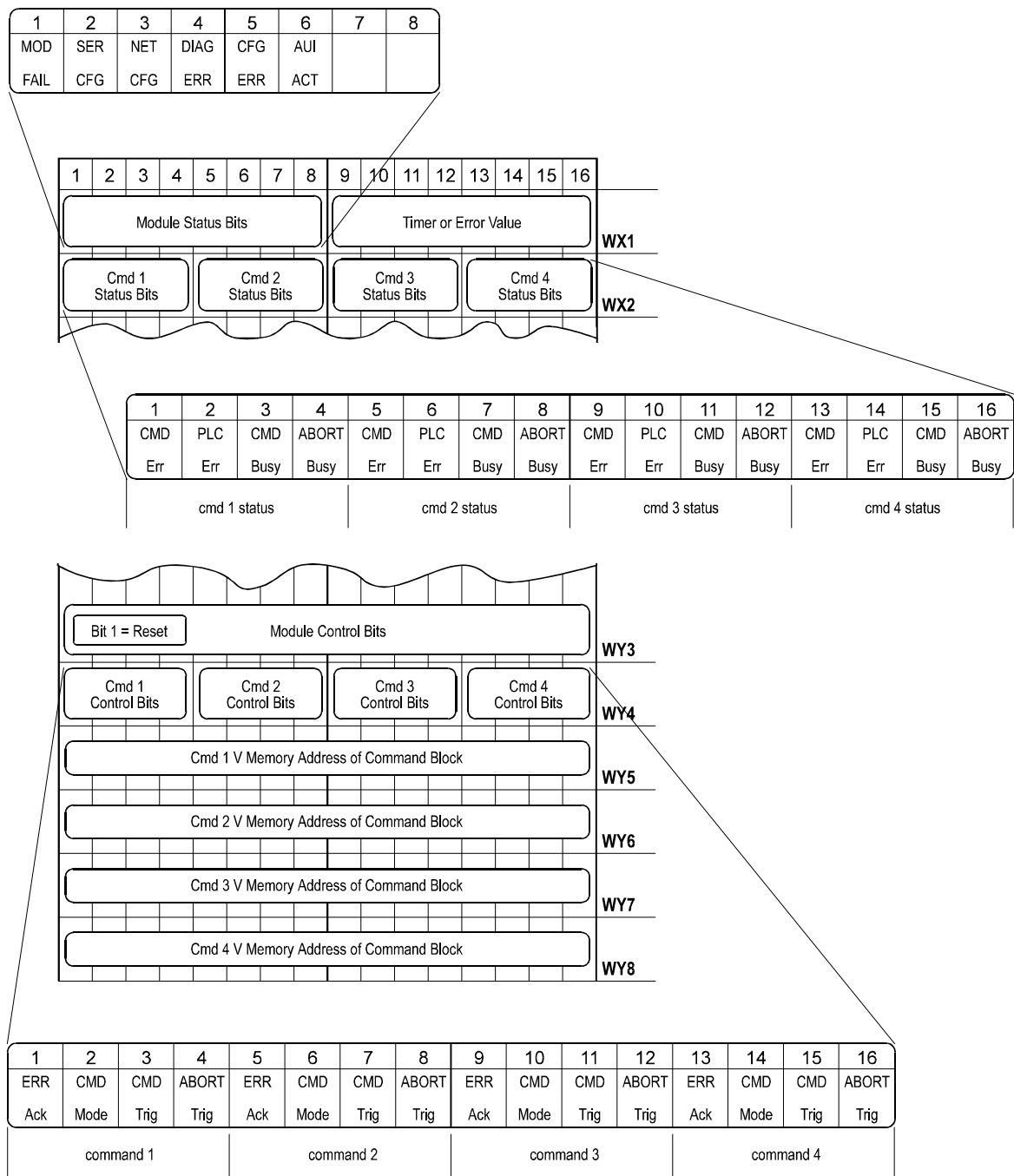
Command Code The Command Code is a number which uniquely defines the command you wish to execute.

Connection Number The connection number identifies the instance of the protocol manager with which you are communicating. A connection number is similar to a file handle used in other operating environments. The connection number is established when a CREATE CONNECTION or CREATE SOCKET command is executed. During this process, a specific protocol manager is loaded and associated with a particular physical port or a network socket. If the connection is created using PLC logic, the programmer can assign a connection number. If the connection is automatically created by the module, the module will assign a connection number.

The high byte of the Connection number should always contain hex 4B. The module uses this byte as a Command Block "signature". The use of the signature byte provides a way for the module to verify that the address you loaded in the command slot indeed points to a valid command block and not some arbitrary area of V memory. When the module detects that you have referenced an area of V memory where the high byte of offset 3 does not contain hex 4B, it asserts the CMD Err and PLC Err. Since the module assumes that a block without a signature byte is not a command block but a reference error, it does not attempt to process the block of V memory and does not write any error information back into offset 0 of the block.

Command Parameters The command parameters provide command execution information. For example, for a Read Command they may specify where to obtain the data, how many words to read, and where to store the results. The number of command parameters required will vary with different commands.

WX/WY Quick Reference



Command Timing Diagrams

Coupled Mode Timing (CMD Mode = 1)

Coupled Mode should be selected when you want to ensure that the module will execute a command only once per trigger. In Coupled Mode the PLC and the module use the CMD TRIG (Command Trigger) and the CMD BUSY (Command Busy) bits in a "handshaking" sequence. The following figure illustrates the timing relationships between CMD TRIG and CMD BUSY for a Coupled Mode command.

The PLC has cleared CMD TRIG (Time A) and the module has cleared CMD BUSY (Time B) indicating that the processing of the previous command is complete.

At Time C, the PLC asserts CMD TRIG to initiate a command. When the module recognizes that CMD TRIG is high, it asserts CMD BUSY (Time D) and samples the CMD MODE bit to determine the command mode. It then retrieves the command block and starts processing the command. Any time after the PLC sees CMD BUSY go high, it may lower CMD TRIG (Time E).

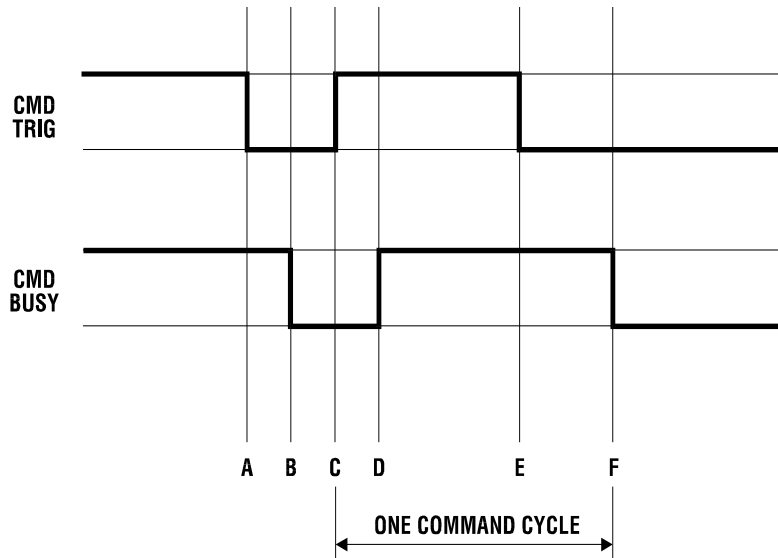


Figure 23. Coupled Mode Timing

Once the module completes processing the command, it samples CMD TRIG. If CMD TRIG is off, the Module will lower CMD BUSY (Time F) and wait for the next trigger. If CMD TRIG is on, the module will hold busy high and wait until CMD TRIG is turned off. Time F will be delayed as required until CMD TRIG is off. At time F (equivalent to time B), both CMD TRIG and CMD BUSY are low and a new cycle can begin whenever the PLC asserts CMD TRIG.

NOTE:

The Command Block is subject to access and change by the module anytime after CMD TRIG is asserted (time C) until CMD BUSY is cleared (time F). Thus, the Command Block should not be changed by the PLC at any time between time C and F.

Uncoupled Mode Timing (CMD Mode =0)

Uncoupled Mode may be selected when close synchronization between the PLC and the module is not required. In this mode, a single trigger can cause the module to execute a command many times. Uncoupled mode is useful in applications where you want to continuously update the remote PLC. Uncoupled Mode usually takes less PLC logic to implement than Coupled Mode. The following figure illustrates the timing relationships between CMD TRIG and CMD BUSY for an Uncoupled Mode command. The shaded area in the diagram indicates that it does not matter what the status of the bit happens to be (*don't care* condition).

At time A, the module has cleared CMD BUSY, indicating that Command processing is complete.

When CMD BUSY is low and CMD TRIG is high the module will assert CMD BUSY (Time B) and begin command processing. CMD BUSY will remain on during the processing of the Command Block. When the processing is complete, the module will lower CMD BUSY (Time C). *Note that in Coupled Mode, the module would wait for the PLC to lower the trigger before clearing CMD BUSY.*

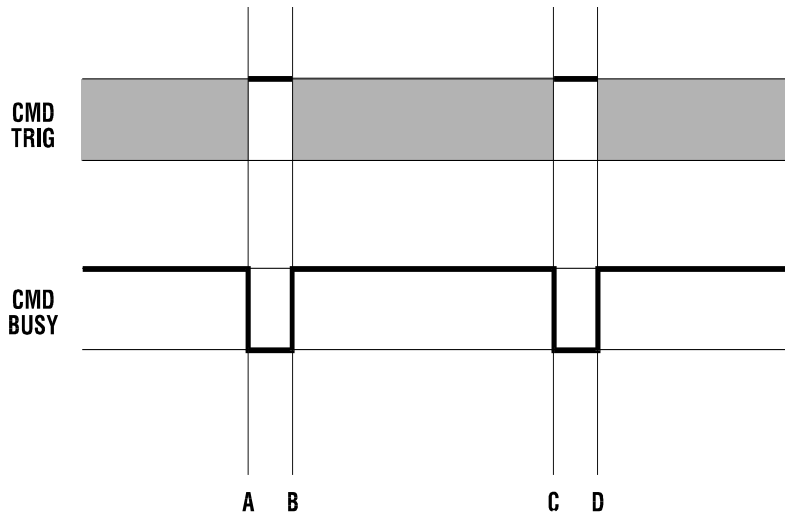


Figure 24. Uncoupled Mode Timing

At the next end of the PLC I/O scan, the module will again

sample CMD TRIG. If CMD TRIG is high, the module will raise CMD BUSY and execute the same command again, without re-reading the Command Block from the PLC. Note that the PLC logic is not required to cycle CMD TRIG.

If continuous operation is desired, the PLC can simply leave the CMD TRIG on. The Module will then repeat the command as fast as possible.

NOTE:

As long as the 2572 detects that CMD TRIG is high when CMD BUSY is lowered, it will execute the same command again. It will not re-read the Command Block from the PLC. Therefore, if you wish to change the command to the module, the PLC logic should clear CMD TRIG and ensure CMD BUSY is cleared before changing the contents of the Command Block or the associated Command Slot. Alternately, use Coupled Mode for these applications.

Command Error Timing

The module provides a mechanism for command execution communicating errors to the PLC. This is accomplished via the CMD ERR bit and the ERROR WORD in the Command Block. The following figure illustrates Command Error timing. Note that the shaded area indicates a "don't care" condition for the particular bit.

At time A, the module has set CMD BUSY and is attempting to retrieve the command block and to process the command.

Some time later, a command processing error occurs. The module writes error information into the error word of the Command Block and asserts CMD ERR at time B. Processing of this command is halted.

If the module cannot write the error word to the Command Block, it also asserts the PLC ERR bit (see the following section).

The error word is valid only when CMD error is asserted and PLC ERR is clear.

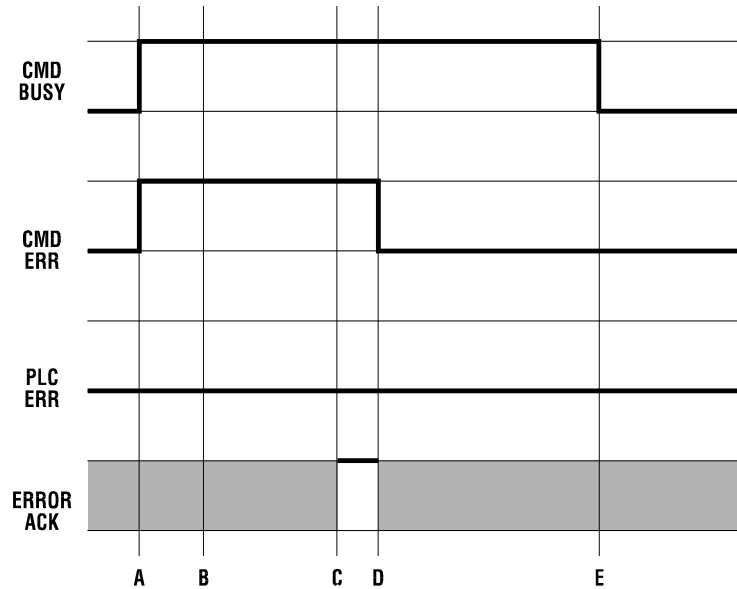


Figure 25. Command Error Timing

At the end of each PLC I/O scan, the module samples the state of ERROR ACK (Error Acknowledge). As soon as the module detects that ERROR ACK is set (Time C), it will turn off CMD ERR (and PLC ERR if on) at Time D and proceed with the error recovery.

After error recovery is completed, the module will clear CMD BUSY (Time E). This may or may not be the in the same PLC I/O scan. CMD ERR will never be asserted unless CMD BUSY is asserted. CMD ERR is always cleared prior to or at the same time as the release of the CMD BUSY signal (Time D is always before or the same as time E).

NOTE:

The contents of the error word in the Command Block is valid only when CMD ERR is asserted and PLC ERR is clear.

Since the ERROR ACK signal is sampled only when CMD ERR or PLC ERR is asserted, PLC logic can leave the ERROR ACK bit on, if you wish to ignore all errors.

PLC Error Timing

A PLC error occurs when the module cannot read a valid Command Block from the PLC V memory or it cannot write back to this location. The following diagram illustrates timing for the PLC ERR bit. Note that the shaded area indicates a "don't care" condition for the particular bit.

At time A, the module has set CMD BUSY and attempts to retrieve the command block from V memory. At time B, the module determines it cannot retrieve a valid command block and asserts the CMD ERR and the PLC ERR bit. Since a valid command cannot be retrieved, the module halts processing of this command.

At time C the module samples the ERROR ACK bit and determines that it is asserted, indicating that the PLC has acknowledged the error. Some time later the module clears the CMD ERR and PLC ERR bits (Time D) and the CMD BUSY bit (Time E). The error bits will always be cleared prior to or at the same time as CMD BUSY.

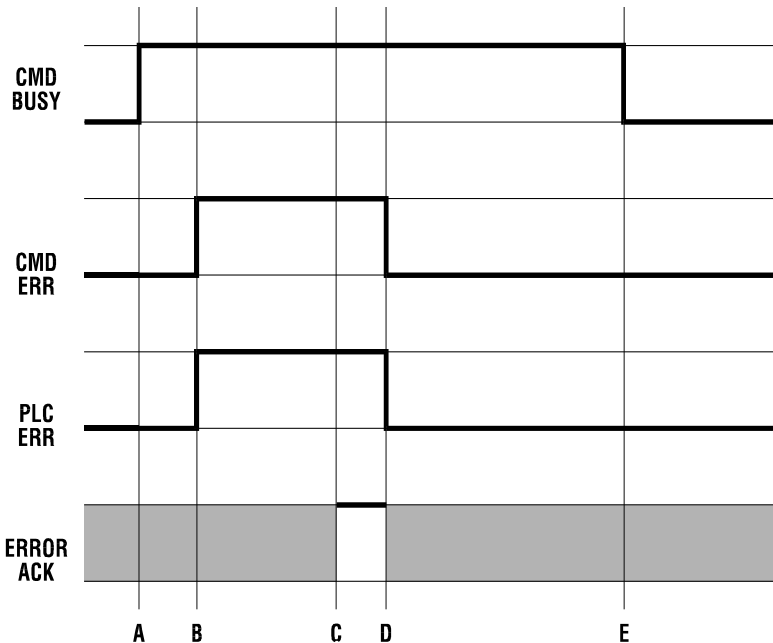


Figure 26. PLC Error Timing

Note that, in this example, no error code is written to the command block. Since a Command Block could not be read, the module does not attempt to write an error code into the V memory location indicated in the command slot.

NOTE:

When the PLC ERR bit is set, it is almost always the result of:

- 1) an invalid address in the Command Slot (WY5, WY6, WY7, or WY8) or*
- 2) a command block connection number that does not have hex 4B in the high byte*

If the PLC ERR bit is on, you should check your PLC logic carefully!

Command Abort Timing

There may be rare occasions when you need to abort a command that is in progress. For example, if you triggered a READ REMOTE command with an infinite timeout and the data was never returned, the protocol manager would wait forever, blocking further execution in the command slot. Figure 27 illustrates abort timing.

Assume the module is busy processing a command (Time A). At time B, the PLC asserts ABORT TRIG to stop the ongoing command processing. When the module recognizes that ABORT TRIG is high, the module will assert ABORT BUSY (Time C).

After detecting ABORT BUSY, the PLC should clear ABORT TRIG (Time D). When the Module has completed abort processing, it clears ABORT BUSY (Time E).

After ABORT BUSY is cleared, the module will clear CMD BUSY (Time F). Time F may be on the same scan or on a later scan than time D.

ABORT BUSY will never be asserted unless CMD BUSY is also asserted.

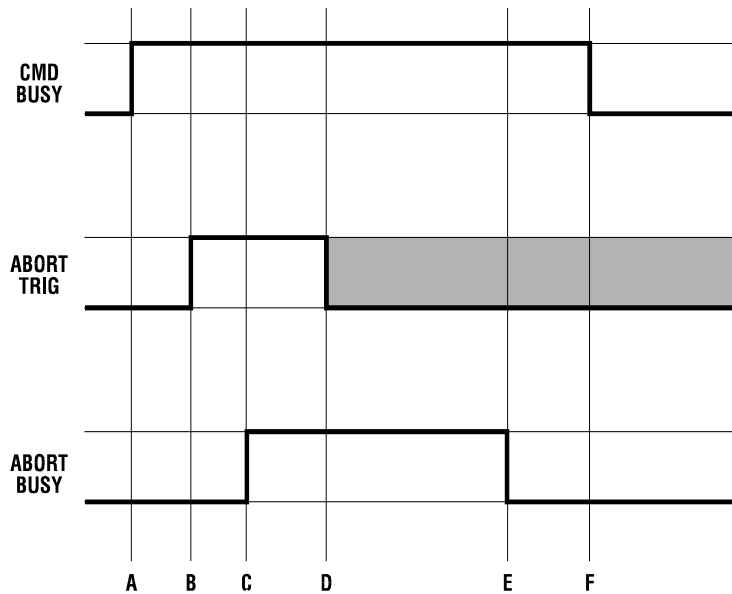


Figure 27. Command Abort Timing

NOTE:

ABORT BUSY will be cleared even if the ABORT TRIG is still active. If the PLC does not clear ABORT TRIG, no further commands will be processed for the Command slot.

Depending upon the nature of the command and circumstances of execution, some commands cannot be aborted.

NOTE:

Setting all four abort triggers and asserting the module reset bit in WY3 will cause the module to perform a complete reset.

General Command Considerations

When designing your PLC logic you should be aware of the following:

- The Command Trigger is ignored for a command if the associated Abort Trigger is set.
- In Uncoupled Mode, the PLC may not see CMD BUSY go low in between command cycles. After you lower the trigger, the module may execute the command additional times.
- If ERR ACK is set and left high, the associated CMD ERR bit may be set and cleared without the PLC detecting it.
- With the notable exception of Module Reset (all four abort triggers are set along with the module reset bit) the command slots are totally independent. Unless the commands are directed to a common resource, the command slots should have no effect on each other.

APPENDIX E. IP ADDRESS INFORMATION

IP Address Nomenclature

Every host interface, or node, on a TCP/IP network is identified by a unique IP address. This address is used to identify a node on a network and the network to which the node belongs.

Each IP address consists of 32 bits, divided into four 8 bit bytes (called *octets*). An IP address is usually expressed in *dotted notation*, with each octet expressed as its decimal equivalent. See the example below.

Notation	Byte 1	Byte 2	Byte 3	Byte 4
Binary	11000000	11011111	10110001	00000001
Decimal	192	223	177	1

Although an IP address is a single value, it contains two pieces of information: the *Network ID* and the *Host ID*. The Network ID identifies a group of computers and other devices that are all located on the same logical network. In internetworks (networks formed by a collection of local area networks), there is a unique network ID for each network. The Host ID identifies a specific device within a particular network.

The Internet community has defined address classes to accommodate networks of varying sizes. Each network class can be discerned from the first octet of its IP address. The following table summarizes the relationship between the first octet of a given address and its Network ID and Host ID fields. It also identifies the total number of Network IDs and Host IDs for each address class that participates in the Internet addressing scheme. This sample uses w.x.y.z to designate the bytes of the IP address.

Class	w values*	Network ID	Host ID	Number of networks	Number of hosts per net
A	1-126	w	x.y.z	126	16,777,214
B	128-191	w.x	y.z	16,384	65,534
C	192-223	w.x.y	z	2,097,151	254

* Inclusive range for the first octet in the IP address. The address 127 is reserved for loopback testing and inter-process communication on the local computer; it is not a valid network address. W values above 223 are reserved for Class D - special protocols such as ICMP multicast.

The 2572 will not allow IP addresses which are Class D addresses (254.0.0.0 or greater) or where the address bits are all zeroes or all ones (0.0.0.0 or 255.255.255.255).

Private IP Addresses

If you are planning on connecting to the 2572 modules via the Internet, you **must** obtain a set of IP addresses from the Internet Assigned Numbers Authority (IANA). You may access the web site at the following URL: <http://www.isi.edu/div7/infra/iana.html> to obtain more information.

If you are certain that you do not need to connect to the Internet, you can use a block of ‘private’ addresses specified in RFC 1597. The private addresses are:

- 10.0.0.0 through 10.255.255.255
- 172.16.0.0 through 172.31.255.255
- 192.168.0.0 through 192.168.255.255

These addresses will not be forwarded by the Internet backbone routers. For more details see the Web site at <http://www.cis.ohio-state.edu/rfc/rfc1597.txt>

Subnet Mask

Although the address class concept provides a standard way to determine the network portion of the IP address there are times that you may wish to further divide an assigned network ID among several local networks. For example, you may wish to install routers to segment network traffic. The Subnet Mask provides the means to accomplish this.

The Subnet Mask is a collection of 32 bits that distinguish the network ID portion of the IP address from the host ID. Subnet masks are determined by assigning 1's to bits that belong to the network ID and 0's to the bits that belong to the host ID. Once the bits are in place, the 32-bit value is converted to dotted decimal notation. See the example below.

Bits for Subnet Mask				Subnet Mask
11111111	00000000	00000000	00000000	255.0.0.0
11111111	11111111	11110000	00000000	255.255.240.0
11111111	11111111	11111111	00000000	255.255.255.0

For example: when the IP address is 128.54.177.97 and the subnet mask is 255.255.255.0, the Network ID is 128.54.177 and the Host ID is 97.

NOTE:

All computers on a physical network must use the same subnet mask and network ID; otherwise, addressing and routing problems can occur.

The Subnet Mask must correspond to the address class of the IP Address.

- For a Class A network, at least the first 8 bits must set to 1.
- For a Class B network, at least the first 16 bits must be set to 1.
- For a Class C network, at least the first 24 bits must be set to 1.

The subnet mask must allow at least two bits of host address. This translates into the requirement that that the subnet mask must contain at least two zeroes. In addition, a subnet mask which causes the derived host address to be 0 or a broadcast address (all bits set to 1) is invalid.

Port Number

The *Port Number* identifies a particular process or service offered by the host. Some services, such as echo server, are provided via standard "well known" port numbers. For the 2572 PLC Network Server facility, you can configure the TCP/UDP port number.

NOTE:

The examples in CTI documents use 1505 (decimal) as the PLC Network Server port number. Unless you have a specific reason for using another number, you should use 1505.

HARDWARE SPECIFICATIONS

Ethernet Ports:

- 1 ea. - IEEE 802.3 10BaseT with RJ-45 connector.
- 1 ea. - IEEE 802.3 AUI port with female DB15 connector.
- 10BaseT port will be automatically selected if a Link Beat is present.
- AUI Power may be derived from PLC backplane or from an external supply.

Serial Communications Ports:

- 1 ea. - RS-232C (subset) with Male DB9 Connector, DTE.
(RS-232 handshake lines include RTS, CTS, DSR, and DTR).
- 1 ea. - RS-422 with Female DB9 Connector.
- 1500 VDC Isolation - channel to PLC.

Standard Serial Port Communications Parameters:

Data Rate:	1200,2400, 9600 ,19200 Baud (switch selectable)
Data Bits:	7
Parity:	Odd
Stop Bits:	1
Hardware Handshaking:	Disabled , Enabled (switch selectable, RS-232 port)

Values in bold represent the factory switch settings.

Software Configurable Serial Port Communications Parameters

Data Rate:	300, 600, 1200, 2400, 4800, 9600, 19200 Baud
Data Bits:	5,6,7,8
Parity:	Even, Odd, None
Stop Bits:	1,2
Handshaking:	Hardware, Software, None

Diagnostic LEDs:

- 1 ea. - Module Status (ACTIVE)
- 3 ea. - Transmit Data (Serial Port 1, Serial Port 2, Ethernet)
- 3 ea. - Receive Data (Serial Port 1, Serial Port 2, Ethernet)
- 1 ea. - 10BaseT Link Beat Detected
- 1 ea. - AUI Port Selected
- 1 ea. - Collision Detected
- 1 ea. - Reversed Polarity (10BaseT Port).

Module Size:

Single Wide 505 I/O

Backplane Power Consumption:

6.0 watts @ 5 VDC

NOTE:

This requirement does not include any power consumed by an optional transceiver attached to the AUI port. If you are using a transceiver, see the Installation Planning section of this manual.

Operating Temperature:

0° to 60° C (32° to 185° F)

Storage Temperature:

-40° to 85° C (-40° to 185° F)

Humidity:

0% to 95%, non-condensing

Agency Approvals:

FM

UL

UL Canada

CE

LIMITED PRODUCT WARRANTY

CTI warrants that this CTI Industrial Product shall be free from defects in material and workmanship for a period of one (1) year after purchase from CTI or from an authorized CTI Industrial Distributor. This CTI Industrial Product will be newly manufactured from new and/or serviceable used parts which are equal to new in the Product.

Should this CTI Industrial Product fail to be free from defects in material and workmanship at any time during this (1) year warranty period, CTI will repair or replace (at its option) parts or Products found to be defective and shipped prepaid by the customer to a designated CTI service location along with proof of purchase date and associated serial number. Repair parts and replacement Product furnished under this warranty will be on an exchange basis and will be either reconditioned or new. All exchanged parts or Products become the property of CTI. Should any Product or part returned to CTI hereunder be found by CTI to be without defect, CTI will return such Product or part to the customer.

This warranty does not include repair of damage to a part or Product resulting from: failure to provide a suitable environment as specified in applicable Product specifications, or damage caused by an accident, disaster, acts of God, neglect, abuse, misuse, transportation, alterations, attachments, accessories, supplies, non-CTI parts, non-CTI repairs or activities, or to any damage whose proximate cause was utilities or utility like services, or faulty installation or maintenance done by someone other than CTI.

Control Technology Inc. reserves the right to make changes to the Product in order to improve reliability, function, or design in the pursuit of providing the best possible Product. CTI assumes no responsibility for indirect or consequential damages resulting from the use or application of this equipment.

THE WARRANTY SET FORTH ABOVE IN THIS ARTICLE IS THE ONLY WARRANTY CTI GRANTS AND IT IS IN LIEU OF ANY OTHER IMPLIED OR EXPRESSED GUARANTY OR WARRANTY ON CTI PRODUCTS, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE AND IS IN LIEU OF ALL OBLIGATIONS OR LIABILITY OF CTI FOR DAMAGES IN CONNECTION WITH LOSS, DELIVERY, USE OR PERFORMANCE OF CTI PRODUCTS OR INTERRUPTION OF BUSINESS, LOSS OF USE, REVENUE OR PROFIT. IN NO EVENT WILL CTI BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR CONSUMER PRODUCTS, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

REPAIR POLICY

In the event that the Product should fail during or after the warranty period, a Return Material Authorization (RMA) number can be requested orally or in writing from CTI main offices. Whether this equipment is in or out of warranty, a Purchase Order number provided to CTI when requesting the RMA number will aid in expediting the repair process. The RMA number that is issued and your Purchase Order number should be referenced on the returning equipment's shipping documentation. Additionally, if the product is under warranty, proof of purchase date and serial number must accompany the returned equipment. The current repair and/or exchange rates can be obtained by contacting CTI's main office at 1-800-537-8398.

When returning any module to CTI, follow proper static control precautions. Keep the module away from polyethylene products, polystyrene products and all other static producing materials. Packing the module in its original conductive bag is the preferred way to control static problems during shipment. Failure to observe static control precautions may void the warranty. For additional information on static control precautions, contact CTI's main office at 1-800-537-8398.

WX / WY Quick Reference

